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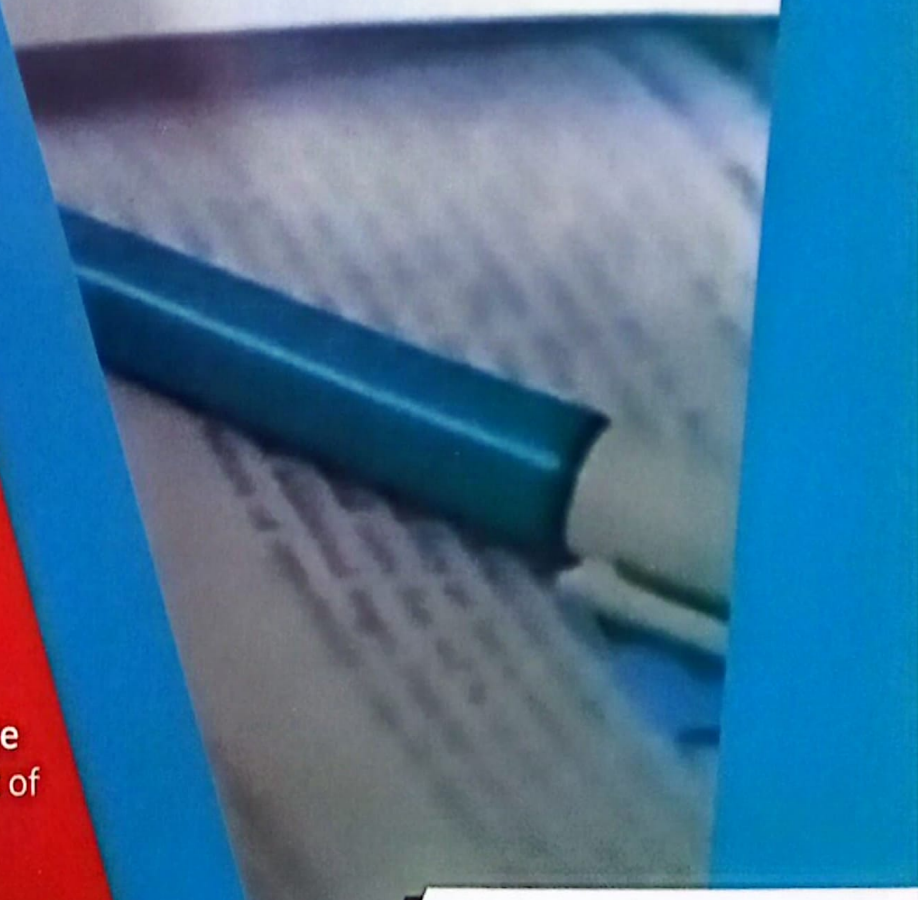

- HEC SCHOLARSHIP
- M.PHIL.
- PHD (Local & Foreign Institutions)

Make the Most of the Time You Have
A Surefire Plan That the Guesswork out of HAT Preparation

DOGAR BROTHERS
A SYMBOL OF AUTHORITY IN PUBLICATION

By: Muhammad Idress

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QUICK HAT

MAKE THE MOST OF THE TIME YOU HAVE

The goal of this modular approach is to get you feeling as comfortable with the exam as possible in a short period of time. You'll probably be overwhelmed trying to internalize so much information in so little time, but better that than sitting down on test day and having no idea what you're doing.

HOW TO USE THIS BOOK?

This book has been written specifically for those who do not have ample time to prepare GAT. This book helps you a lot to have GAT prepared in very short period of time.

Modular Approach

The Book has been divided into 9 Modules. Each module requires 3 to 5 hours to be covered depending upon your working and comprehending speed and capability. You are strongly, recommended to complete each module in one day. However; if you do not have 9 days to reach the test day then you can take the number of modules per day based on the days you have.

HAT IN A GLANCE

HAT (General) – Graduate Assessment Test is for admissions in MS / M. Phil programs.

Candidates with a minimum of sixteen years of education are eligible to appear in the test.

Total number of questions = 100
Time allowed = 120 minutes

MODULE || 01

Analytical Reasoning

- Types of Questions
- Terminologies and Techniques with solved examples.
- Practice Drill with explanations of all questions.

Quantitative Reasoning

- Number system
- Arithmetic Operations
- Finding LCM and GCD
- Inequalities
- Solved Practice Drill for each topic

Vocabulary

- Word list to be used in the next module.

ANALYTICAL REASONING

Most people believe that Analytical Reasoning section is the most difficult part of the HAT. They are right. The questions are disproportionately hard for two reasons: First, the questions are complex, convoluted, and subtle. Second, it is the most highly "timed" part of the test. That is, you are intentionally not given enough time to finish.

Although this may sound intimidating, everyone taking the HAT is in the same situation. You probably have never seen this type of problem during your academic career. No specific college course will prepare you for them, except perhaps mathematics.

Furthermore, questions are the easiest problems on which to improve, for two reasons:

1. The process of solving a question is very systematic.
2. There are only a few different kinds of questions: just three major categories, plus a couple that don't quite fit.

This chapter is dedicated to classifying the major types of questions and then mastering their systematic solution.

THE THREE MAJOR TYPES OF QUESTIONS

ORDERING Questions

These questions require you to order elements, either in a line or around a circle. The criteria used to determine order can include size, time, rank, etc. Ordering questions are the easiest questions on the HAT. Luckily, they are also the most common.

Example:

Six people — Rizwan, Shaukat, Tnaveer, Uzma, Waleed, and Wajahat — are standing in line for tickets to an upcoming concert.

Rizwan is fifth in line and is not next to Shaukat.

Uzma is immediately behind Tnaveer.

Wajahat is not last.

Which one of the following people must be last in line?

(A) Shaukat (B) Tnaveer (C) Uzma
(D) WaleeD. (E) Rizwan

Solution:

Clearly, Rizwan cannot be last since he is already fifth. So eliminate choice (E).

Next, neither Tnaveer nor Uzma can be last since Uzma must stand immediately behind Tnaveer. So eliminate choices (B) and (C).

Finally, Shaukat cannot be last, either. If he were, then he would be next to Rizwan, which would violate the first condition. So eliminate choice (A). Hence, by process of elimination, Waleed must be last in line. **The answer is (D).**

This method of elimination is the most efficient way to solve many, if not most, game questions. We will discuss this method in more detail later.

GROUPING Questions

Grouping Questions, as the term implies, require you to separate elements—typically people—into groups. Some conditions of the question can apply to entire groups only, some to elements within a group only, and some to both. This added complexity makes grouping questions, in general, harder than ordering questions.

Example:

Eight people - A, B, C, D, E, F, G, and H - ride to work in three cars. Two cars each take three people, and one car takes only two people.

B rides with H.

G rides with only one other person.

F rides with two other people.

If C rides with B, all of the following are groups of people that can ride together, EXCEPT:

(A) A and G
(B) G and E
(C) A, D, and E
(D) A, D, and F
(E) B, C, and H

Combining the conditions, *"C rides with B"* and *"B rides with H"* gives the completed car-pool CBH. Now F and G must ride in different car-pools because G rides in a pool of two and F rides in a pool of three. However, the group ADE, in choice (C), could not ride with either F or G because in either case they would form a group of four. **Hence, (C) is the answer.**

ASSIGNMENT Questions

These questions involve assigning characteristics to the elements, typically people. The most common task in these questions is to assign a schedule. You probably have had some experience with schedules; you may have written the weekly work-schedule for a business. If so, you know how difficult the task can become, even when only a few conditions are placed on the employees: Baber will work Monday, Tuesday, or Friday only. Shabana will work evenings only. Shahid will not work with Baber. Add to this that the company must have a full staff weekday, but only three people can work weekends. Scheduling questions on the HAT are similar to this. Because the conditions can apply to individuals separately, to groups of individuals, to times, to places, etc., scheduling questions tend to be the most difficult - save them for last.

Example:

The Mom & Pop Beverage store employs five cashiers - Adams, Bashir, Sher Khan, Dilawer, and Ilyas - each of whom works alone on exactly one day, Monday through Friday. Adams will work only on Tuesday or Thursday. Bashir will not work on Monday or Wednesday. Sher Khan works on Friday. Dilawer and Ilyas do not work on consecutive days.

Which one of the following is a possible work schedule?

(A) Ilyas, Bashir, Adams, Dilawer, Sher Khan
(B) Dilawer, Adams, Bashir, Ilyas, Sher Khan
(C) Ilyas, Adams, Sher Khan, Bashir, Dilawer
(D) Ilyas, Adams, Dilawer, Bashir, Sher Khan
(E) Dilawer, Ilyas, Bashir, Adams, Sher Khan

Begin by eliminating (A); it is not a possible work schedule since the first condition states that Adams works only on Tuesday or Thursday. Next, (B) is not a possible work schedule since the second condition states that Bashir will not work on Monday or Wednesday. Next, (C) is not a possible work schedule since the third condition states that Sher Khan works on Friday. Finally, (E) is not a possible work schedule since the last condition states that Dilawer and Ilyas do not work on consecutive days. Thus, by process of elimination, we have learned **the answer is (D).**

We will thoroughly analyze each of the three major types of questions. Additionally, we will study some questions that do not fit neatly into this classification.

Skipping a Question Set

Because questions are difficult and time consuming, you should consider skipping the hardest one.

Do not, however, skip parts of each question; rather, skip one entire question set.

The time you save by skipping the hardest question can be used to read and solve the other questions more carefully. **Reading and solving the problems too quickly is the major cause of errors in this section of the test.** The questions come in sets of 4 to 6, so misreading the setup to a question's conditions can cause you to miss an entire set of questions.

If you decide to skip the hardest question, you will need, of course, some criteria to determine which question is the hardest. You might think that a question with many conditions is harder than one with only a few conditions. This is not necessarily true. In fact, most often, the fewer the conditions the harder the question.
Think of the conditions as clues. If you were a detective investigating a case, the more clues you had the easier the case would be to solve. The same is true for questions. Furthermore, some of the conditions are often superfluous or are needed only for the last couple of questions. As mentioned before, **ordering questions generally are the easiest, grouping questions are harder, and assignment questions are the hardest.**

Order of Difficulty

Unlike most standardized tests, the questions on the HAT are not listed from the easiest to the hardest. If they were, then deciding which question to skip would be easy - skip the last question. However, this much can be said: the first question will not be the hardest and the last question will not be the easiest; do not, therefore, skip the first question. This is also true of the question-set to a question.

Reading with Precision

We are not accustomed to reading and thinking with the degree of precision required for the questions. If I ask you to count from one to four, you will probably respond with: one, two, three, four. But is this the correct response? I said to count from one to four, not from one through four. So the correct response actually is one, two, and three. This may seem like "splitting hairs", but it is precisely this degree of precision which must be exercised when reading the conditions of a question.
Typically, when reading, we skim the words looking for the gist of what the writer is trying to convey. However, the conditions of a question *cannot be* read in that manner. They must be read slowly and carefully, taking each word for its literal meaning - and making no unwarranted assumptions.
It may seem at times that the wording of a game is designed to trick you. A question is a logic puzzle that must be solved by applying the fundamental principles of logic - that is, common sense - to the given conditions. If a word has two different meanings, then two different answers may be possible. For this reason, ambiguity in a question cannot be tolerated.

To avoid ambiguity, the HAT always use the literal or dictionary meaning of a word.

To illustrate, take the little, nondescript word "**or.**" We have little trouble using it in our day-to-day speech. However, it actually has two meanings, one inclusive and one exclusive. In the sentence "Shazia or Javed may come to the party" we understand that both may come. This is the *inclusive* meaning of "or." On the other hand, in the phrase "your money or your life" we hope that the mugger intends the *exclusive* meaning of "**or.**" That is, he does not take both our money and our life.

Unless otherwise stated, the meaning of "or" on the HAT is inclusive.

Unwarranted Assumptions

When analyzing a question, you must not only take the meaning of the words literally but you must also take the meaning of the sentences literally.
That is, do not make any unwarranted assumptions about what a condition implies. For example, if the setup to a problem states that five people are standing in a line and a condition states that Sharif is standing behind Shahida, then you *cannot* assume he is immediately behind her. There may be one or more people between them. For another

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example, take the word "never" in the sentence "Shahida never arrives at work before Tara." Based on this statement we cannot assume that Tara always arrives before Shahida; they may on occasion arrive at the same time. For a subtler example, take the sentence "Javed will go only if Sharif goes." We cannot assume that if Sharif goes, then Javed will go too. The sentence implies only that if Javed left, then Sharif must also have left, not necessarily vice versa. The last two sections are not intended to imply that you should dwell on minutia. Instead, they should alert you to pay attention to the exact meanings of words and sentences. Words are used in their literal sense, not to make the conditions "tricky," but to avoid ambiguity.

UNWARRANTED ASSUMPTION DRILL

Directions:

Each condition in this exercise is followed by a series of deductions. Determine whether each deduction is valid or invalid. Answers and solutions begin after the drill.

1. **A and B are two consecutive elements in a line.**
   a. A is next to B.
   b. A is to the left of B.
   c. C is between A and B.

2. **Of four elements - A, B, C, D - in a line, B sits between A and C.**
   a. B is next to A.
   b. B is next to either A or C.

3. **Only people over eighteen years of age can enter.**
   a. A person eighteen years of age can enter.

4. **Javed is older than Maria who is younger than Batool, and Rizwan is not older than Maria.**
   a. Maria is younger than Javed.
   b. Maria is older than Rizwan.
   c. Batool is older than Rizwan.

5. **To be in the theater, each child (a person less than 13 years old) must be accompanied by an adult.**
   a. Jasim who is ten could be in the theater by himself.
   b. Javed who is thirty-five could be in the theater by himself.

6. **If it is cloudy, then Baber is not at the beach.**
   a. If it is sunny, Baber is at the beach.
   b. If Baber is not at the beach, it is cloudy.
   c. If Baber is at the beach, it is not cloudy.

7. **I will take the HAT unless I am not prepared.**
   a. I prepared thoroughly, so I took the HAT.
   b. I prepared thoroughly, but I did not take the HAT.

8. **On a line A and B are two spaces apart.**
   a. Two people sit between A and B.

9. **Only Baber works evenings.**
   a. Baber works only evenings.

SOLUTIONS

1. **a. Valid**
   Saying that A is next to B is equivalent to saying that A and B are consecutive.

   b. Invalid
   Although A is written to the left of B, we cannot assume that its position on the line is left of B.

   c. Invalid

If C were between A and B, then A and B would not be consecutive.

2. a. **Invalid**

We know only that B is between A and C, not whether B is next to A. (The ordering could be ADBC.)

b. **Valid**

D is the only element which can separate B from either A or C. Therefore, B must be next to either A or C - though not necessarily both.

3. a. **Invalid**

A person eighteen years of age is not over eighteen.

4. a. **Valid**

"Javed is older than Maria" is logically equivalent to "Maria is younger than Javed."

b. **Invalid**

We know only that Rizwan is not older than Maria; they may be the same age.

c. **ValiD.**

Since Batool is older than Maria who is older than or the same age as Rizwan, Batool must be older than Rizwan.

5. a. **Invalid**

According to the statement, he must be with an adult.

b. **Valid**

We know only that children must be accompanied by an adult; the reciprocal relation that adults be accompanied by children need not be true.

6. a. **Invalid**

We know only that if it is in fact cloudy, then Baber is not at the beach. We know nothing about where he is when it is sunny.

b. **Invalid**

Again, we know only that if it is cloudy then Baber is not at the beach. It may be sunny, and Baber may decide not to go to the beach.

c. **Valid**

If it were in fact cloudy, this would contradict the premise, "if it is cloudy, then Baber is not at the beach."

7. a. **Valid**

Generally, "unless" means "if...not." So the sentence can be recast as "I will take the HAT if I am prepared." (Note two negatives make a positive, so the phrase "if I am *not not* prepared" was simplified to "if I am prepared.") With this interpretation of the sentence, we see that the two statements are consistent. In fact, the second statement necessarily follows from the first.

b. **Invalid**

This contradicts the premise of the statement.

8. a. **Invalid**

Many students confuse these two conditions. They do not mean the same thing. "A and B are two spaces apart" means that only one spot separates them.

9. a. **Invalid**

"Only Baber works evenings" means only that no one else works evenings. Baber could still work an afternoon shift in addition to his evening shift.

LOGICAL CONNECTIVES

While no training in formal logic is required for the HAT, essentially it is a logic test. So some knowledge of formal logic will give you a definite advantage.

The statement "if A, then B" means by definition "if A is true, then B must be true as well," and nothing more.

For example, we know from experience that if it is raining, then it is cloudy. So if we see rain falling past the window, we can validly conclude that it is cloudy outside. There are three statements that can be derived from the implication "if A, then B"; two are invalid, and one is valid.

From "if A, then B" you *cannot* conclude "If B, then A." For example, if it is cloudy, you cannot conclude that it is raining. From experience, this example is obviously true; it seems silly that anyone could commit such an error. However, when the implication is unfamiliar to us, this fallacy can be tempting.

Another, and not as obvious, fallacy derived from "if A, then B" is to conclude "if not A, then not B." Again, consider the weather example. If it is not raining, you cannot conclude that it is not cloudy - it may still be overcast. This fallacy is popular with students.

Finally, there is one statement that *is* logically equivalent to "if A, then B." Namely, **"if not B, then not A."** This is called the **contrapositive,** and it is very important.

If there is a key to performing well on the HAT, it is the contrapositive.

To show the contrapositive's validity, we once again appeal to our weather example. If it is not cloudy, then from experience we know that it cannot possibly be raining. We now know two things about the implication "if A, then B":

1) If A is true, then B must be true.

2) If B is false, then A must be false.

If you assume no more than these two facts about an implication, then you will not fall for the fallacies that trap many students.

We often need to rephrase a statement when it's worded in a way that obscures the information it contains. The following formulas are very useful for rewording and simplifying the conditions of a question.

On the HAT, as in everyday speech, two negatives make a positive - they cancel each other out.

not (note A) = A

Example:

"It is not the case that John did not pass the HAT" means the same thing as "John did pass the HAT."

DIAGRAMMING

Virtually every question can be solved more easily and efficiently by using a diagram. Unless you have a remarkable memory and can process reams of information in your head, you **must** draw a diagram. Because of the effectiveness of diagrams, questions are the best candidates for improvement. A well-constructed diagram can change a convoluted, unwieldy mass of information into an easily read list. In-fact, from a well-constructed diagram, you can often read-off the answers without any additional thought.

Before we begin studying how to construct diagrams, we need to develop some facility for creating and manipulating symbols.

Symbols

The ability to symbolize sentences is one of the most important skills you need to develop for the HAT. A good symbol is complete; it summarizes all the relevant information in the sentence. It is succinct. And it is functional, easy to use. The last condition makes creating symbols an art. A good symbol helps you organize your thoughts and frees your mind from the fetters of indecision.

Five basic symbols are used throughout this book. They are

Symbol	Meaning
&	and
Or	or
~	not
⇨	If .... then
( )	Parenthesis shows a group

I. The ampersand symbol, &, connects two statements of equal rank. The two statements **"Rizwan sits next to Javed"** and **"Shazia sits next to Alam"** can be translated as

(RJ) & (SA)

Two statements joined by "&" will be true as a group only when both are true.

II. The symbol **"or"** also connects two statements of equal rank. The above statement can be symbolized using "or" as

(RJ) or (SA)

For an ***or*-statement** to be true, only one of the two statements need be true, though both can be. For example, the statement **"it is raining" or "it is not raining"** is true even though one of the statements must be false. This makes an ***or*-statement** much weaker than an **&-statement**.

III. Placing **~** in front of any true statement makes the statement false, and vice versa. The symbol **~** can be read as "it is not the case that." For example, the symbol ~(RJ) translates as "it is not the case that R sits next to J."

IV. The *if..., then...* symbol (⇨) causes much consternation, even though we are rarely confused by its meaning in everyday speech. It is true in all cases, except when the statement on the left side is true and the statement on the right side is false. "if P, then Q" is logically equivalent to "if not Q, then not P"; the latter is the contrapositive. For example, the statement **"if it is sunny, then Baber is at the beach"** is logically equivalent to **"if Baber is not at the beach, then it is not sunny."**

Sometimes you can use this equivalency to simplify a convoluted condition. For example, the condition **"if Jaweria does not go, then Shaber will not go"** can be simplified to **"if Shaber goes, then Jaweria goes,"** or in symbols

S ⇨ J

V. Parentheses clarify a symbol statement's meaning in the same way that commas clarify sentences. The symbol statement A&B ⇨ C is ambiguous; we don't know whether it means

(A&B) ⇨ C or **A& (B ⇨ C)**

Sometimes parentheses are used even when they are not truly needed. For example, the symbol statement **~A&B** is not technically ambiguous; however, it is less likely to be misread when written **(A) &B**. Now clearly the negation applies only to the A.

POINTS TO REMEMBER

1	Unless you are one of the few who have a knack for questions, you should skip the hardest one. This will leave you with ample time per question.
2	The three major types of questions are Ordering Games Grouping Games Assignment Games
3	Although the questions are not presented in ascending order of difficulty, the first question will not be the hardest and the last question will not be the easiest.
4	Do not assume that a question with many conditions is harder than one with only a few.
5	In general, ordering questions are the easiest, and assignment questions are the hardest.
6	Read the conditions to a question very carefully, and avoid making any unwarranted assumptions about what they imply.
7	A ⇨ B is logically equivalent to its contrapositive ~B ⇨ ~A. It is not logically equivalent to the following fallacies: **~A ⇨ ~B (Invalid)** **B ⇨ A (Invalid)**
8	The following logical connectives are equivalent: **~(~A) = A** **(A ⇨ B and B ⇨ A) = (A ⇔ B)** **(A only if B) = (A ⇨ B)** **(A ⇨ B and B ⇨ C) = (A ⇨ C)** **(A unless B) = (~B ⇨ A)**
9	On the HAT, the meaning of "**or**" is inclusive, unless stated otherwise.
10	The questions to a question set are independent of one another.
11	In general, independent elements can be placed in more positions than dependent elements. Think of independent elements as "**wild cards**".
12	When answering the questions, refer to the diagram. Avoid returning to the original problem.
13	Before turning to the questions, note any readily derived conditions.
14	Keep your diagrams simple and functional.
15	Do not erase previously derived diagrams.

SYMBOL EXERCISE

Directions: Translate the given statements into symbols. Note: There is no "best" symbol. However, you should choose one that is short yet clear. Write your answer symbol in the corresponding right column cell.

	Statement	Symbol
1	On a line, B is to the immediate right of A.	
2	On a line, B is to the right of A.	
3	On a line, B is to the right of either A or C, but not both.	
4	On a line, A is not next to B.	
5	On a line, B and A are two spaces apart.	

6	If A, then B.	
7	A only if B.	
8	Four people are standing in a line. If A is last, then A must be next to either B or C.	
9	Four people are standing in a line. A is next to B if and only if C is last.	
10	Of three people, Baber is older than Shazia but younger than Tanveer.	
11	A and B are before C, and C is before X and Y.	
12	At a table, if Baber sits next to Tanveer, Alyas does not sit next to Chawla.	
13	At a table, Mr. Waseem sits directly opposite from Mrs. Alyas.	
14	A and B cannot serve on a panel unless they serve together.	
15	Javed lives two floors above Chawla.	

Solution:

	Statement	Symbol
1	On a line, B is to the immediate right of A.	AB
2	On a line, B is to the right of A.	A...B
3	On a line, B is to the right of either A or C, but not both.	A...B...C **Explanation:** The statement is equivalent to "B is between A and C," which can be symbolized as A...B...C The line linking A with C, the "flip-flop" symbol, indicates that A and C can be interchanged. The symbol ABC would be misleading because it implies that B is next to A and C, which cannot be assumed.
4	On a line, A is not next to B.	~(AB)
5	On a line, B and A are two spaces apart.	A __ B Explanation: Many people incorrectly symbolize this as A __ __ B

		because they read "two spaces apart" as "separated by two spaces"
6	If A, then B.	A ⇨ B
7	A only if B.	A ⇨ B
8	Four people are standing in a line. If A is last, then A must be next to either B or C.	(A=last) ⇨ (AB or AC)
9	Four people are standing in a line. A is next to B if and only if C is last.	(AB) ⇔ (C=last) **Explanation:** This is a double implication. That is, if A is next to B, then C is last; and if C is last, then A is next to B. Remember the symbol AB means that A is next to B, though not necessarily in that order.
10	Of three people, Baber is older than Shazia but younger than Tanveer.	TBS
11	A and B are before C, and C is before X and Y.	(A&B) > C > (X&Y)
12	At a table, if Baber sits next to Tanveer, Alyas does not sit next to Chawla.	(BT) ⇨ ~(AC)
13	At a table, Mr. Waseem sits directly opposite from Mrs. Alyas.	W ⇔ A (Here, ⇔ means "opposite to")
14	A and B cannot serve on a panel unless they serve together.	(A=P) ⇔ (B=P), (where P stands for "is on the panel")
15	Javed lives two floors above Chawla.	J □ C Note that only one floor separates J and C - not two floors.

QUANTITATIVE REASONING

NUMBER SYSTEM

Numbers	Definition	Example	Points to remember
Natural Numbers	Numbers used for counting and ordering	1, 2, 3, 4, 5, ----- natural numbers	No fraction and decimal are included in this type o numbers.
Whole Numbers	All counting numbers along with zero form a set of whole numbers	0, 1, 2, 3, 4 ------ whole numbers	Any natural number is a whole number. Zero is a whole number. Zero is no a natural number.
Integers	Counting numbers plus negative counting numbers and zero, all are integers	-2, -1, 0, 1, 2, ---- integers	**Positive integers:** 0, 1, 2, 3, ------- **Negative integers:** -1, -2, 3, -4, ---------
Even Numbers	Number divisible by 2 is called as even number	0, 2, 4, 6, 8, ------ even numbers	
Odd Numbers	Number not divisible by 2 is called as even number	1, 3, 5, 7, 9, ------ odd numbers	
Prime Numbers	A number having exactly two factors i.e. 1 and itself is called as prime number	2, 3, 5, 7, 11, ----- prime numbers	One is not a prime number. 2 is the only eve prime number.
Composite Numbers	Natural numbers which are not prime numbers are called as composite numbers	4, 6, 8, 9, 10, ----- composite nos.	
Co Primes	Any two natural numbers x and y are co-prime if their HCF is 1	(4, 5), (7, 9), ---Co-prime numbers	

DIVISIBILITY RULES

The simple divisibility rules will help you to find factors of a number.

The number is divisible by:

2	if the last digit is 0, 2, 4, 6, or 8 (example: 12346)
3	if the sum of digits in the number are divisible by 3 (example: 1236, because 1+2+3+6 = 12 = 3 x 4)
4	if the last 2 digits are divisible by 4 (example: 897544, because 44 = 4 x 11)
5	if the last digit is 0 or 5 (example: 178965 or 40980)
6	if it is divisible by 2 and 3
7	sorry, no rule (you have to divide)
8	if the last 3 digits are divisible by 8 (example: 124987080, because 080 = 8 x 10
9	if the sum of digits is divisible by 9 (example: 234612, because 2+3+4+6+1+2 = 18 = 9 x 2)
10	If the unit digit is 0

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11	If the difference between the sums of the digits at even places and the sum of digits at odd places is either 0 or divisible by 11. **Ex: 4527039** Digits on odd places: 4 + 2 + 0 + 9 =15 Digits on even places: 5 + 7 + 3 = 15 Difference between odd and even = 0 Therefore, number is divisible by 11
12	The number is divisible by both 4 and 3

Factor of a number

A factor of a given number is every number that divides exactly into that number.

Example

Write down all factors of 10.
10 = 2 x 5, so numbers 2 and 5 are factors of 10.
Also 10 = 10 x 1, so 10 and 1 are factors of 10.
The factors of 10 are 1, 2, 5, 10.
Number 1 and the number itself are always factors of any number.

Example:

Find all prime factors of 30.

Solution:

All the factors of 30 are 30, 15, 10, 6, 5, 3, 2, 1
But only 5, 3 and 2 are prime numbers.
Therefore, all prime factors of 30 are 2, 3 and 5.

If a number is divisible by 2 factors, it is also divisible by the product of these factors.

Example 1: Number 18 is divisible by 2 and 3, so it must be divisible by 2 x 3 = 6.
Example 2: Number 945 is divisible by 9 and by 5, so it must be divisible by 9 x 5 = 45.

Common Factors

When two (or more) numbers have **the same** factor, that factor is called a **common factor.**

Example

Find all the common factors of 12 and 18.
Factors of 12 are 1, 2, 3, 4, 6, 12.
Factors of 18 are 1, 2, 3, 6, 18.
The common factors of 12 and 18 are 1, 2, 3 and 6.

Highest Common Factor (HCF)

The Highest Common Factor (H.C.F) of two (or more) numbers is the largest number that divides evenly into both numbers.
In **other** words, the H.C.F is the largest of all the common factors. The common factors or of 12 and 18 are 1, 2, 3 and 6. The largest common factor is 6, so this is the H.C.F. of 12 and 18.
It is very easy **to find a H.C.F. of small numbers,** like 6 and 9 (it is 3) or 8 and 4 (it is 4).
The best way is to keep finding the factors of the smaller number, starting from the largest factor. The first factor of the smaller number that is also a factor of the larger number is a H.C.F.

FINDING THE H.C.F. OF BIG NUMBERS

For larger numbers you can use the following method:

1. Find all prime factors of both numbers.
2. Write both numbers as a multiplication of prime numbers.
3. Find which factors are repeating in both numbers and multiply them to get H.C.F.

Example:

Find the Highest Common Factor (H.C.F.) of 240 and 924.

Solution:

Finding all prime factors of 240:

We will start with the smallest prime number and we will divide 240 into it if we can.
We will do the same with the result (or quotient), and we will keep dividing by prime numbers until we have 1 as a quotient.
Each time we write the prime factor to the right and the quotient below:

240 | 2	2 is a factor of 240;	240 divided by 2 is 120
120 | 2	2 is a factor of 120;	120 divided by 2 is 60
60 | 2	2 is a factor of 60;	60 divided by 2 is 30
30 | 2	2 is a factor of 30;	30 divided by 2 is 15
15 | 3	3 is a factor of 15;	15 divided by 3 is 5
5 | 5	5 is a factor of 5;	5 divided by 5 is 1
1		

240 = 2 x 2 x 2 x 2 x 3 x 5

Finding all prime factors of 924:

924 | 2	2 is a factor of 924;	924 divided by 2 is 462
462 | 2	2 is a factor of 462;	462 divided by 2 is 231
231 | 3	3 is a factor of 231;	213 divided by 3 is 77
77 | 7	7 is a factor of 77;	77 divided by 7 is 11
11 | 11	11 is a factor of 11;	11 divided by 11 is 1
1		

924 = 2 x 2 x 3 x 7 x 11

Multiply the factors, which repeat in both numbers to get the H.C.F.

The Highest Common Factor is 2 x 2 x 3 = 12

Multiples and Common multiples

When you **multiply a given whole number by any other whole number**, the result is a **multiple** of that number.
For example, 5 is the first multiple of 5 (because 5 x 1 = 5), 10 is the second multiple of 5, and so on.

Example 1:

Write down the first 3 multiples of 8.

Solution:

8 x 1 = 8, 8 x 2 = 16, 8 x 3 = 24, so the first 3 multiples of 8 are 8, 16, 24.

Example 2:

Write down all multiples of 3 greater than 10 but smaller than 20.

Solution:

Multiples of 3 are 3, 6,9,**12,15,18,**21,24,...
The desired ones are 12,15,18.
The **common multiples** of two numbers are **multiples of both numbers.**

Example 1:

Find common multiples of 3 and 5.

Solution:

Multiples of 3 are
3,6,9,12,**15**,18,21,24,27,**30**,33,...
Multiples of 5 are 5,10,**15**,20,25,**30**,35,...
Common multiples of 3 and 5 are 15, 30, ...

Lowest common multiple (L.C.M.)

The Lowest Common Multiple (L.C.M) is the smallest number that is a common multiple of two or more numbers.
For example, the L.C.M of 3 and 5 is 15.

The simple method of finding the L.C.M of smaller numbers is to write down the multipl of the larger number until one of them is also multiple of the smaller number.

Example 1:

Find the Lowest Common Multiple of 8 and 1

Solution:

Multiples of 12 are 12, 24...
24 is also a multiple of 8, so the L.C.M of 8 a 12 is 24.

Finding L.C.M. Of big numbers

1. Find all the prime factors of both numbers.
2. Multiply all the prime factors of the larger number by those prime factors

the smaller number that are not already included.

Example:

Find the Lowest Common Multiple (L.C.M.) of 240 and 924.

Find the prime factors of both numbers.

$924 = 2 \times 2 \times 3 \times 7 \times 11$

$240 = 2 \times 2 \times 2 \times 2 \times 3 \times 5$

The L.C.M. is $2 \times 2 \times 3 \times 7 \times 11 \times 2 \times 2 \times 5 = 924 \times 20 = 18,480$

Basic Formulae:

1. $(a-b)^2 = (a^2 + b^2 - 2ab)$
2. $(a+b)^2 = (a^2 + b^2 + 2ab)$
3. $(a+b)(a-b) = (a^2 - b^2)$
4. $(a^3 + b^3) = (a+b)(a^2 - ab + b^2)$
5. $(a^3 - b^3) = (a-b)(a^2 - ab + b^2)$
6. $(a+b+c)^2 = a^2 + b^2 + c^2 + 2(ab+bc+ca)$
7. $(a^3 + b^3 + c^3 - 3abc)$
   $= (a+b+c)(a^2 + b^2 + c^2 - ab - bc - ac)$

POINT TO REMEMBER

1) Sum of the first n odd numbers = n^2
2) Sum of first n even numbers = n (n + 1)
3) Even numbers divisible by 2 can be expressed as 2n, n is an integer other than zero.
4) Odd numbers which are not divisible by 2 can be expressed as 2(n + 1), n is an integer.

Drill

1. Find which of the following number is divisible by 11?
   a. 246542 b. 415624
   c. 146532 d. 426513

2. Find the largest 4-digit number which is divisible by 88.
   a. 8844 b. 9999
   c. 9944 d. 9930

3. Find the solution of (935421 × 625) = ?
   a. 584638125 b. 524896335
   c. 542879412 d. 582365890

4. Find the solution of
$$\frac{(450+280)^2 - (450-280)^2}{(450 \times 280)}$$
   a. 21 b. 10
   c. 7 d. 4

5. The remainder is 29, when a number is divided 56. If the same number is divided by 8, then what is the remainder?
   a. 3 b. 4
   c. 7 d. 5

6. The remainder is 3, when a number is divided 5. If the square of this number is divided by 5, then what is the remainder?
   a. 5 b. 4
   c. 7 d. 1

7. If the sum of two numbers is 31 and their product is 240, then find the absolute difference between the numbers.
   a. 1 b. 3
   c. 4 d. 5

8. Find the three consecutive odd numbers whose sum of the squares is 2531.
   a. 19, 21, 23 b. 23, 25, 27
   c. 27, 29, 31 d. 31, 33, 35

9. The sum of squares of three numbers is 138 and the sum of their products taken two at a time is 131. Find their sum.
   a. 35 b. 42
   c. 20 d. 18

10. Find a positive number which when increased by 11 is equal to 60 times the reciprocal of the number

a. 3 b. 4
c. 6 d. 9

11. 5 times a positive number is less than its square by 24. What is the integer?

a. 5 b. 8
c. 7.5 d. 9

Answers and Explanation:

Q 1.

Correct option: B

Hint:
Number divisible by 11:

If the difference between the sums of the digits at even places and the sum of digits at odd places is either 0 or divisible by 11.
Using the hint, we can easily find the number which is divisible by 11.
Option a) 246542
Sum of digits at even places = (2 + 6 + 4) =12
Sum of digits at odd places = (4 + 5 + 2) = 11
Sum of digits at even places - Sum of digits at odd places = (12 – 11) = 1
Hence, the number is not divisible by 11

Option b) 415624
Sum of digits at even places = (4 + 5 + 2) =11
Sum of digits at odd places = (1 + 6 + 4) = 11
Sum of digits at even places - Sum of digits at odd places = (11 – 11) = 0
Hence, the number is divisible by 11

Option c) 146532
Sum of digits at even places = (1 + 6 + 3) =10
Sum of digits at odd places = (4 + 5 + 2) = 11
Sum of digits at even places - Sum of digits at odd places = (10 – 11) = -1
Hence, the number is not divisible by 11

Therefore, correct answer is option (b) 415624

Q 2.

Correct Option: (c)

We know that the largest 4 digit number is 9999.
Simply divide 9999 by 88.
After dividing 9999 by 88 we get, 55 as remainder.
The number is said to be completely divisible, only if the remainder is zero.
Hence, we can find the required answer by subtracting the remainder obtained from the 4 digit number.
Therefore, required number = 9999 – 55 = 9944

Q 3.

Correct Option: (a)

In this type of questions, try to simplify the numbers, to find the answer easily.
We are asked to multiply (935421 × 625)
625 is divisible by 5 and $5^4 = 625$
This 5^4 can be written as $(10/2)^4$

Hence

$$935421 \times \frac{10^4}{2^4} = \frac{9354210000}{16} = 584638125$$

Q 4.

Correct Option: (d)

Remember the basic formula:
$(a + b)^2 = a^2 + 2ab + b^2$
$(a - b)^2 = a^2 - 2ab + b^2$
If we substitute these formulae, we get

Q 5.

Correct Option: (d)

We know that,
Dividend = [(Divisor × Quotient)] + Remainder
It is given that, the remainder is 29, when a number (dividend) is divided 56(divisor).
Dividend and quotient are unknown, hence assume dividend as X and quotient as Y.

Therefore,
$X = 56 \times Y + 29$
56 is completely divisible by 8, but 29 is not completely divisible and we get remainder as 5, which is the required answer.
OR
$X = 56 \times Y + 29$
$= (8 \times 7Y) + (8 \times 3) + 5$
5 is the required remainder.

Q 6.

Correct Option: (b)

We know that,
Dividend = [(Divisor × Quotient)] + Remainder
It is given that, the remainder is 3, when a number (dividend) is divided 5(divisor).
Dividend and quotient are unknown, hence assume dividend as X and quotient as Y.
$X = (5Y) + 3$
The square of this number is divided by 5, therefore
$X^2 = (5Y + 3)^2$
Simplifying we get,
$X^2 = (25Y^2 + 30Y + 9)$
On dividing this equation, we get
$5(5Y^2 + 6Y + 1) + 4$
The remainder is 4, because 9 is not exactly divisible by 5 and we get 4 as remainder.

Q 7.

Correct Option: (a)

Let two numbers be x and y
We are given that, sum of two numbers $x + y = 31$ and product = $xy = 240$
Therefore,

$$x - y = \sqrt{(x+y)^2 - 4xy}$$

Substituting the values, we get

$$x - y = \sqrt{(31)^2 - 4xy}$$
$$= \sqrt{961 - 960}$$
$$= \sqrt{1}$$
$$= 1$$

The required difference between the numbers is 1.

Q 8.

Correct Option: (c)

Let three consecutive odd numbers be x, x+2, x+4.
$x^2 + (x + 2)^2 + (x + 4)^2 = 2531$
Simplifying we get,
$x^2 + 4x - 837 = 0$
27 x 31 = 837 and also the difference between 27 and 31 is 4
Therefore,
$x^2 + 31x - 27x - 837 = 0$
$(x + 31)(x - 27)$
$X = 27$ or $x = -31$
Hence, the value of
x = 27
(x + 2) = 27 + 2 = 29
(x + 4) = 27 + 4 = 31

Q 9.

Correct Option: (c)

Let the three numbers be x, y and z.
Given: Sum of squares of three numbers is 138 and sum of their products taken two at a time is 131
Therefore,
$x^2 + y^2 + z^2 = 138$
$xy + yz + zx = 131$
Formula: $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$
This formula can be used to easily find the sum of three numbers. Substituting the values, we get
$(x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$
$(x + y + z)^2 = 138 + 2(131)$
$(x + y + z)^2 = 400$
Hence, (x + y + z) = 20

Q 10.

Correct Option: (b)

Let the number be x.
A positive number (x) increased by 11 is equal to 60 times the reciprocal of the number (1/x)

$$x + 11 = \frac{60}{x}$$
$$x^2 + 11x - 60 = 0$$
$$x^2 + 15x - 4x - 60 = 0$$
$$x(x + 15) - 4(x + 15) = 0$$
$$(x + 15)(x - 4) = 0$$
$$x = 4$$

The positive number (x) = 4

Q 11.

Correct Option: (b)
Let the unknown number be x.
5 times a positive number = 5x
5 times a positive number is less than its squar
by 24
$x^2 - 5x = 24$
$x^2 + 3x - 8x - 24$
$x(x + 3) - 8(x + 3)$
$(x - 8)(x + 3)$
$x = 8$
8 is the required integer.

FRACTIONS

It represents a part of a whole or more generally, any number of equal parts. If a unit is divided into any number of equal parts, then one or more of these parts is termed as a fraction of the unit.

1) The numerator in a fraction represents a number of equal parts and denominator (≠0) represents how many of those parts make up a unit or a whole.
2) The value of fraction (x/y) = 1, if numerator = denominator
3) The value of fraction is zero, if numerator=0 and denominator ≠0
4) The value of fraction is infinity, if the denominator=0
5) The value of fraction remains unchanged, even if the numerator and denominator are multiplied or divided by same number
6) Pure recurring decimal: In a decimal fraction, if all the numbers after decimal point repeat, then it is called as pure recurring decimal.
7) Mixed recurring decimal: In a decimal fraction, if some numbers are repetitive and some are not, then it is called as mixe recurring decimal.

BODMAS RULE

This rule is used to solve and find out the value of given expressions by performing the operations in a correct sequence.

BODMAS is the shortcut used to remember the procedure of simplification.

B: Bracket
O: Order (i.e. power, square root etc.)
D: Division (Left to right)
M: Multiplication (Left to right)
A: Addition (Left to right)
S: Subtraction (Left to right)

The operations are to be performed strictly in the order: **Division, Multiplication, Addition and Subtraction.**

When simplifying the given expressions, first brackets are to be removed in the order:
'—', '( )', '{ }', '[ ]'.

Addition and subtraction of decimal fractions

To add or subtract the decimal fractions, numbers are placed under each other in such a way, that the decimal points lie in one column.

Example:

12.361 + 0.236 + 1236.1

$$\begin{array}{r} 12.361 \\ 0.236 \\ 1236.1 \\ \hline 1248.697 \end{array}$$

Multiplication of decimal fractions by power of 10

The decimal point in the given number is shifted to the right as many places as is the power of 10.

Example:

4.236 × 100 = 423.6 or 0.563 × 1000 = 563

Multiplication of decimal fractions

Multiply the given numbers without considering the decimal points. Now mark the decimal point in the product by calculating the sum of number of decimal places in the given numbers.

Example:

0.5 × 0.03 × 0.83,
5 × 3 × 83 = 1245
No. of decimal places = 1 + 2 + 2 = 5
Now mark the decimal point after 5 places starting from left.
Answer = 0.01245

Division of a decimal fraction

Divide the given numbers without considering the decimal points. Now mark the decimal point in the quotient obtained, by calculating the number of decimal places in the dividend.

Example:

(0.0133 ÷ 19)
(133 ÷ 19)=7
Dividend contains 4 places of decimal. Hence, the answer is 0.0007

Decimal fraction ÷ Decimal fraction

Example:

Divide 0.00025 by 0.5
Divide the number without considering decimal
= 25/5 = 5
Now mark the decimal points (to the left) in the quotient obtained by calculating the number of decimal places in the dividend.
= 0.00005
Then reduce decimal (move to right) by calculating the number of decimal places in the divisor.
= 0.0005

Comparison of fractions

If fraction in the form $\frac{4}{5}, \frac{7}{8}$ are to be compared or are to be arranged in ascending of descending order, then simply convert these fractions into decimal form and then compare.

Example:

Arrange

$$\frac{4}{5} \quad \frac{3}{5} \quad \frac{6}{8}$$

in descending order
4/5 = 0.8, 3/5 = 0.6, 6/8 = 0.75
0.8 > 0.75 > 0.6, hence (4/5) > (6/8) > (3/5)

Drill

Q 1. Which of the following has fractions in ascending order?

a. $\frac{2}{5}, \frac{3}{5}, \frac{1}{3}, \frac{4}{7}, \frac{5}{6}$

b. $\frac{1}{3}, \frac{2}{5}, \frac{3}{5}, \frac{5}{6}, \frac{4}{7}$

c. $\frac{1}{3}, \frac{2}{5}, \frac{5}{6}, \frac{4}{7}, \frac{3}{5}$ d. $\frac{1}{3}, \frac{2}{5}, \frac{4}{7}, \frac{3}{5}, \frac{5}{6}$

Q 2. If $\frac{347.624}{0.0089} = a$, then find the value of $\frac{347624}{0.0089} = ?$

a. $\frac{a}{10}$ b. 10 a

c. a/1000 d. 1000 a

Q 3. Find the value of

$$\frac{(.555 \times .555 - .555 \times .020 + .020 \times .020)}{(.555 \times .555 \times .555) + (.020 \times .020 \times .020)}$$

a. 1.55 b. 1.74

c. 2.36 d. 5.02

SOLUTIONS:

Q 1.

Correct Option: (d)

Convert fractions into decimal form. These calculations are to be solved quickly in mind otherwise will require a lot time.
Option 1: 0.4, 0.6, 0.33, 0.5, 0.8 --- (wrong)
Option 2: 0.3, 0.4, 0.6, 0.8, 0.5 --- (wrong)
Option 3: 0.3, 0.4, 0.8 , 0.5, 0.6 --- (wrong)
Option 4: 0.33, 0.4, 0.5, 0.6, 0.8 --- (correct)
0.33 < 0.4 < 0.5 < 0.6 < 0.8 ---- (Ascending order)

Q 2.

Correct Option: (c)

Given: $\frac{347.624}{0.0089} = a$

The value of $\frac{347624}{0.0089} \div 1000 = a \div 1000 = a/1000$

Q 3.

Correct Option: (b)

The given numerical is in the form

$$\frac{(a^2 - ab + b^2)}{(a^3 + b^3)} = \frac{(a^2 - ab + b^2)}{(a+b)(a^2 - ab + b^2)} = \frac{1}{(a+b)}$$

$$\frac{(0.555^2) - (0.555 \times 0.020) + (0.20^2)}{(0.555^3) + 0.020^3}$$

$$= \frac{1}{(0.555 + 0.020)} = 1.74$$

MODULUS OF A REAL NUMBER

The modulus of a real number or the absolute value is defined as follows:
Modulus of x is written as $|x|$

$$|x| = \begin{cases} x, & \text{if } x > 0 \\ -x, & \text{if } x < 0 \end{cases}$$

Drill

Q 1. Simplify:

$$y - \left[y - (x+y) - \left\{y - \left(y - \overline{x - y}\right)\right\} + 2\right]$$

a. 0 b. x

c. 4x d. x/2

Q 2. Simplify: $13.05 \times 4.5 \div 0.5$

a. 117.45 b. 112.32

c. 115.50 d. 120.60

Q 3. Simplify:

$$\left\{5\frac{1}{2} - \left(7\frac{1}{2} + 2.8 \div x\right)\right\} \times 4.25 \div (0.2)^2 = 306$$

a. 1.963 b. 2.847

c. 3.562 d. 4.963

SOLUTION:

Q 1.

Correct Option: (c)

Follow the rule of 'BODMAS'
Step 1: Solve the expression below bar
$y - [y - (x + y) - \{y - (y - x + y)\} + 2x]$
Step 2: Solve () bracket
$y - [y - (x + y) - \{y - (2y - x)\} + 2x]$
$y - [-x - \{y - 2y + x\} + 2x]$
Step 2: Solve {} bracket
$y - [-x - \{y - 2y + x + 2x\}]$
$y - [-x - \{-y + 3x\}]$
$y - [-x + y - 3x]$
Step 3: Solve [ ] bracket
$y + 4x - y$
$4x$

Therefore, correct answer is 4x i.e option (c)

Q 2.

Correct Option: (a)

Follow the rule of 'BODMAS'
No bar, No bracket. Hence, first step starts from 'DMAS'

Step 1: Divide $4.5 \div 0.5 = 9$
Step 2: Multiply $13.05 \times 9 = 117.45$

Q 3.

Correct Option: (c)

Follow the rule of 'BODMAS'
Step 1:

$$10 - \left\{5\frac{1}{2} - \left(\frac{15}{2} + 2.8 \div x\right)\right\} \times 4.25 \div (0.2)^2 = 306$$

$$10 - \frac{\{5.5x - 7.5x - 2.8\}}{x} \times \frac{425}{4} =$$

Step 2:

$$10 - \frac{\{-2x - 2.8\}}{x} \times 106.25 = 306$$

$$10 - \left\{\frac{\{-212.5x - 297.5x\}}{x}\right\} = 306$$

Step 3:

$$\frac{10x + 212.5x + 297.5}{x} = 306$$

$$(306 - 222.5)x = 297.5$$

$$x = \frac{297.5}{(306 - 222.5)} = 3.562$$

SQUARE ROOT AND CUBE ROOT

(1) Square root: If a2 = b, we say that the square root of b is a it is written as $\sqrt{b} = a$

(2) Cube root: Cube root of a is denoted as $\sqrt[3]{a}$

(3) $\sqrt{ab} = \sqrt{a} \times \sqrt{b}$

(4) $\sqrt{(a/b)} = \frac{\sqrt{a}}{\sqrt{b}} = \frac{\sqrt{a}}{\sqrt{b}} \times \frac{\sqrt{b}}{\sqrt{b}} = \frac{\sqrt{ab}}{b}$

Number	Squares	Cubes
1	1	1
2	4	8
3	9	27
4	16	64
5	25	64
6	36	216
7	49	343
8	64	512
9	81	729
10	100	1000

Find the numbers which have same digit in unit's place:

Numbers	Square
2	4
3	9
4	16
5	25
6	36
7	49
8	64
9	81

- Squares of 2 and 8 have units digit: 4
- Squares of 3 and 7 have units digit: 9
- Squares of 4 and 6 have units digit: 6
- Squares of 5 has units digit: 5
- Square of 9 has unit digit: 1

Square Root of 5-digit Number

17424 – Split the numbers

174 | 24

Find a no. near to 174	Last digit ends with 4
13 × 13 = 169 < 174	Hence, last digit of the number will be 2 or 8
14 × 14 = 196	Multiply 13 with next higher number 14
	13 × 14 = 182
	Compare 182 with first number, 182 > 174
	Hence select the smaller number among 2 and 8
First number is 13	Second number is 2

Hence, the square root is 132

Step 1: Ignore last two digits 24 and just consider first three digits.

Step 2: Find a number near or less than 174 Which has a perfect squave root. 169 is a number near to 174 which is perfect square of 13. Hence, the number in ten's place 13.

Step 3: Find the number in unit's place: 4 is the number in unit's place. Hence, remember the table, 2 and 8 numbers have unit's digit 4

Step 4: Now we have to find the correct number among 2 and 8.

Step 5: Multiply 13 (First number) with next higher number (14) i.e 13 × 14 = 182. Number 182 is greater than the first three digits, hence consider the smallest number among 2 and 8 i.e 2.Therefore, second number is 2.

Square root of 17424 = 132

Square Root of 4-digit Number

6084 – Split the numbers into 60 and 84 [60 84]	
60	84
Find a number near to 60	Last digit ends with 4
8 × 8 = 64	Hence, last digit of the answer will be 2 or 8
7 × 7 = 49 .....60 < 49	To check:
	Multiply 7 with next higher num 8 = 7 × 8 = 56
	Compare 56 with first two numbers 56 < 60
	Hence, select the greater number 8
First number = 7	Second number 8

Hence, the square root is 6084 = 78

Step 1:

Ignore last two digits 8 and 4 and just consider first two digits.

Step 2:

Find a number near or less than 60. 49 is a number near to 60 which is perfect square of 7. Hence, the number in ten's place is 7.

Step 3:

Find the number in unit's place: 4 is the number in unit's place. Hence, remember the table, 2 and 8 numbers have unit's digit 4.

Step 4:

Now we have to find the correct number among 2 and 8.

Step 5:

Multiply 7 with next higher number (7 + 1) = 8 i.e 7 × 8 = 56. Number 56 is less than the first two digits, hence consider the largest number among 2 and 8 i.e 8. Therefore, second number is 8.

Square root of 6084 = 78

Square Root of 3-digit Number

784 – Split the number [7 84]	
Find a number near to 7	Last digit ends with 4
3 × 3 = 9 2 × 2 = 4 .....4 < 7	Last digit ends with 4 Hence,last digit of the number will be 2 or 8 Multiply 2 with next higher number 3 = 2 × 3 = 6 Compare 6 with first number 7. 6 < 7 Hence select the grater number among 2 and 8
First number is 2	Second number is 8

Hence, the square root is 28

Step 1: ignore last two digits and consider the first digit.

Step 2:

Step 1 Ignore last two digits arid consider the first digit.

Step 2: Find a number near or less than 7. 4 is a number near to 7 which is a perfect square of 2, Hence, *the number in ten's place is 2.*

Step 3: *Find the number in* unit's *place:* 4 is the number in units place. Hence, remember the table, 2 and 8 numbers have units digit 4

Step 4: Now we have to find the correct number among 2 and 3.

Step 5: Multiply 2 with next higher number (2 + 1= 3) i.e 2 x 3 - 6. Number 6 is less than the first digit, hence consider the largest number among 2 and 8. Therefore, second number is8.

Square root of 784 = 28

Drill

Q 1. Find the square root of 5929

a. 49 b. 33

c. 77 d. 73

Q 2. If $\sqrt{15625} = 125$, then find the value of $\left(\sqrt{156.25} + \sqrt{1.5625} + \sqrt{0.015625} + \sqrt{0.00015625}\right)$

a. 1.38875 b. 13.8875

c. 138.875 d. 1388.75

Q 3. If $\sqrt{0.09 \times 0.9 \times a} = 0.009 \times 0.9 \times \sqrt{b}$, then $\frac{a}{b}$ is_____

a. 9×10^{-3} b. 9×10^{-5}

c. 81×10^{-4} d. 81×10^{-5}

Solution

Q 1.

Correct Option: (c)

Remember the trick discussed in Quick Tips and Tricks

Step 1: Split the number 59 29

$7^2 = 49$ is the nearest number to 59. Hence, the digit in ten's place is 7.

Step 2: Last digit of number 29 is 9. Therefore, 3 or 7 are the digits in unit's place.

Multiply 3 by next consecutive higher number i.e. 4

$3 \times 4 = 12$

But $12 < 59$, hence consider the largest numb among 3 and 7.

The digit in unit's place is 7.

Hence, the square root of 5929 is 77

Q 2.

Correct Option: (b)

Write the given expression without decimal points.

$$\sqrt{\frac{15625}{100}} + \sqrt{\frac{15625}{10^4}} + \sqrt{\frac{0.015625}{10^6}} + \sqrt{\frac{0.00015625}{10^8}}$$

$$\sqrt{\frac{15625}{10}} + \sqrt{\frac{15625}{100}} + \sqrt{\frac{15625}{1000}} + \sqrt{\frac{15625}{10000}}$$

We are given, $\sqrt{15625} = 125$

Therefore,

$$\frac{125}{10} + \frac{125}{100} + \frac{125}{1000} + \frac{125}{10000}$$

$$= 12.5 + 1.25 + 0.125 + 0.0125$$

$$= 13.8875$$

Q 3.

Correct Option: (d)

The given question can be written in th form of $\frac{\sqrt{a}}{\sqrt{b}}$

$$\frac{\sqrt{a}}{\sqrt{b}} = \frac{0.009 \times 0.9}{\sqrt{0.09 \times 0.9}}$$

Squaring both sides, we get

$$\frac{a}{b} = \frac{0.009 \times 0.9 \times 0.009}{0.09 \times 0.9} = \frac{0.0000729}{0.09}$$

$$= \frac{0.00729}{9} 0.00081 = 81 \times 10^{-5}$$

EXPONENTS

Laws of Indices

1. $x^m \times x^n = a^{m+n}$
2. $(x^m)^n = x^{mn}$
3. $(xy)^n = x^n y^n$
4. $\frac{x^m}{x^n} = x^{m-n}$
5. $\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$
6. $x^{-1} = \frac{1}{x}$

Laws of Surds

1. $\sqrt[n]{x} = x^{(1/n)}$
2. $\sqrt[n]{xy} = \sqrt[n]{x} \times \sqrt[n]{y}$
3. $\sqrt[n]{(x/y)} = \frac{\sqrt[n]{x}}{\sqrt[n]{y}}$
4. $\left(\sqrt[n]{x}\right)^n = x$
5. $\sqrt[m]{n\sqrt{x}} = \sqrt[mn]{x}$
6. $\left(\sqrt[n]{x}\right)^m = \left(\sqrt[n]{x^m}\right)$

Points to Remember

1. Any number raised to the power zero is always equals to one. (Eg: $x^0 = 1$)
2. Surd $\sqrt[n]{x}$ can be simplified if factor of x is a perfect square.
3. If denominator in a fraction has any surds, then rationalize the denominator by multiplying both numerator and denominator by a conjugate surd.
4. Every surd is an irrational number, but every irrational number is not a surd.
5. The conjugate of $(2 + 7i)$ is $(2 - 7i)$
6. Different expressions can be simplified by rationalizing the denominator and eliminating the surd.

Drill

Q 1. ¾ part of tank is full of water. When 30 litres of water is taken out it becomes empty. The capacity of the tank is?

a. 36 litres b. 42 litres
c. 40 litres d. 38 litres

Q 2. The sum of four consecutive integers is 1290. The greatest of them is?

a. 321 b. 322
c. 323 d. 324

Q 3. 280 oranges are divided among some boys and girls whose total number is 50 so that each boy gets 5 oranges and each girl get 7 oranges. The number of girls is

A. . 30 b. 35
c. 15 d. 20

Q 4. A number is multiplied by its one-third to get 192. Find the number.

a. 16 b. 20
c. 24 d. 28

Q 5. A boy was asked to multiply a number by 12. But he multiplied by 21 and got his answer 63 more than the correct answer. The number to be multiplied was

a. 7 b. 9
c. 8 d. 12

Q 6. What will come in place of the question mark (?) In the following question?

112.36 + 225.05 + ? = 815.30

a. 474.46 b. 477.89

c. 524.41 d. 564.40

Q 7. What is the value of $(1^2 + 2^2 + 3^2 + 4^2 + \cdots + 10^2)$

a. 295 b. 324
c. 385 d. 391

Q 8. The difference between a number and its two-fifth is 45. What is the number?

a. 64 b. 75
c 80 d. 89

Q 9. The unit digit in the product (624 * 708 * 913 * 463) is:

a. 2 b. 5
c. 6 d. 8

Q 10. Greatest Common Divisor of two numbers is 8 while their Least Common Multiple is 144. Find the other number if one number is 16.

a 108 b. 96
c. 72 d. 36

Q 11. The greatest number of four digits which is divisible by 15, 25, 40, 75 is

a. 600 b. 9000
c. 9600 d. 9400

Q 12. What will be least number of marbles with Rahim if he can arrange them in rows of 18, 10 and 15 marbles each as well as make a perfect solid square out of all the marbles?

a. 133 b. 43
c. 90 d. 900

Q 13. What is LCM of 36/225, 48/150 , 72/65 ?

a. 36/65 b. 144/5
c. 72/225 d. 288/5

Q 14. The L.C.M. of two number is 60. The numbers are in the ratio 4 : 5. Find the sum of numbers.

a. 27 b. 33
c. 38 d. 45

Q 15. The L.C.M. Of 2, 2.7 and 0.09 is:

a. 5.4 b. 0.54
c. 0.054 d. 54

Q 16. What is value of 945.341-1042.792+875.435+31.025?

a. 908.004 b. 810.008
c. 795.659 d. 809.009

Q 17. What will be value of (74.6-38.9-5.7)/(26.4-18.9) ?

a. 3.5 b. 2.25
c. 2.0 d. 4.0

Q 18. What will be the value of 1 x 0.3 x 0.01 x 0.003?

a. 0.000009 b. 0.000027
c. 0.00009 d. 0.00003

Q 19, 0.003 * 0.5 =?

a. 0.00015 b. 0.0015
c. 0.015 d. 0.15

Q 20. When 0.535353 ... is converted into a fraction, the result is

a. 5/17 b. 20/9
c. 53/99 d. 53/100

Q 21. $5\frac{1}{5} + 4\frac{1}{2} + 4\frac{1}{3} = ?$

a. 14(1/10) b. 13(1/5)
c. 13/30 d. 14(1/30)

Q 22. 2 x ? - 6 = 676/26 What will come in place of question mark?

a. 9 b. 15/26
c. 16 d. 26

Q 23. An integer is 10 more than its one-third part. The integer is

a. 15 b. 12
c. 18 d. 25

Q 24. If x/4 – (x – 3)/5 = 1, then find the value of x.

a. 3 b. 6
c. 8 d. 11

Q 25. $(0.4)^2 + (0.2)^2 = \sqrt{?}$

a. 0.04 b. 0.4
c. 0.06 d. 0.2

Q 26. Sum of squares of two numbers is 145. If square root of one number is 3, find the other number.

a. 136 b. 9
c. 64 d. 8

Q 27. What is value of $(0.000001)^{1/6}$?

a. 0.000001 b. 0.001
c. 1/100 d. 0.1

Q 28. How many zeroes are there in 2000^{10}?

a. 10 b. 30
c. 20 d. 15

Q 29. Find the value of X. $(15)^{3.5} * (15)^{x} = 15^{8}$

a. 2.29 b. 2.75
c. 4.25 d. 4.5

Q 30. What is value of $[(3 \times 3 \times 3 \times 3 \times 3)^{6} \div (3 \times 3 \times 3 \times 3)^{7} \times 3^{4}]$?

a. 279 b. 274
c. 315 d. 910

SOLUTIONS:

Q1.

Explanation:

Initially tank is $3/4^{th}$ full.
On removing 30 litres it becomes empty which means
$3/4^{th}$ part = 30 litres
So 1 2hole (entire tank) means? Litres?

$$\frac{30 \times 4}{3} = 40 \text{litres} = \text{capacity of tank}$$

Q2.

Explanation:

Let the 4 consecutive integers be m, m+1, m+2 and m+3

$\therefore m+m+1+m+2+m+3=1290$

$\therefore m=321$

Greatest number =m+3 =324

Q3.

Explanation:

Let number of boys be 'm' and number of girls be 'n'

$\therefore m+n = 50$

$\therefore m=50-n$

Also, total oranges = 280

$\therefore 5m+7n=280$

$\therefore 5(50-n)+7n=280$

$\therefore 250-5n+7n=280$

$\therefore n=15$=number of girls

Q4.

Approach 1 – Direct Observation

On multiplying by $1/3^{rd}$, the answer is 192 that is a whole number.

So, the number must be divisible by 3.

In the options only 24 is divisible by 3.

Approach 2 – By solving

Let the number be 'N'

As per given condition,

$$N \times \frac{N}{3} = 192$$

$$\therefore N^2 = 192 \times 3 = 4 \times 48 \times 3$$

$$= 4 \times 16 \times 3 \times 3 = 2^2 \times 4^2 \times 3^2$$

$$\therefore N = 2 \times 4 \times 3 = 24$$

Q5.

Explanation:

Let the number be 'm'

So, as per given condition,

21m-12m =63

$\therefore 9m = -63$

$\therefore m = 7$ = required number

Q6.

Explanation:

815.30 - (112.36 + 225.05) = ?
= 477.89

Q 7.

Explanation:

$(1^2 + 2^2 + ... + n^2) = (1/6)\ n(n + 1)\ (2n + 1)$

Here, n = 10

Therefore,

$(1^2 + 2^2 + ... + 10^2) = (1/6)\ 10\ (10 + 1)\ (2 \times 10 + 1)$

$= (1/6) \times 10 \times 11 \times 21$

$= 385$

Q 8.

Explanation:

Let the number be x.

$x - (2 / 5)\ x = 45$

$(3/5)\ x = 45$

$x = 75$

Q 9.

Explanation:

Unit digit in the given product = Unit Digit in (4*8*3*3) = 8 (288)

Q 10.

Tip: If A and B are two numbers, then A × B = HCF of A and B × LCM of A and B

Therefore; 16 × ? = 8 × 144 ? = 72

Q 11.

Explanation:

We want 4 digit number, so option A is not the answer

Now we want greatest number. So out of remaining options, 9600 is greatest 9600 is divisible by 25, 75, 40 and 15

So answer is C i.e. 9600

Q 12.

Explanation:

We need the least number, which means we must first find LCM of 18, 10 and 15

3	18	10	15
2	6	10	5
5	3	5	5
	3	1	1

∴ LCM = 3×2×5×3 = 90

90 is not a perfect square.

90 = 3×3×2×5

Here there are two 3's (this gives square of 3) but only one 2 and one 5

If we multiply by 2 and 5 then we get,

3×3×2×2×5×5=900

900 is perfect square = number of marbles

Q 13.

Explanation

Numerators = 36,48 and 72.

72 is largest number among them. 72 is not divisible by 36 or 48

Start with table of 72.

72×2=144=divisible by 72, 36 and 48

∴ LCM of numerators = 144

Denominators = 225, 150 and 65

We can see that they can be divided by 5.

On dividing by 5 we get 45, 30 and 13

We cannot divide further.

So, HCF = GCD = 5

LCM of fraction = $\frac{144}{5}$

Q 14.

Explanation:

Let the numbers be 4x and 5x.

Then, their L.C.M. = 20x.

20x = 60 or x = 3.

The numbers are 12 and 15.

Hence, required sum = (12 + 15) = 27.

Q 15.

Explanation:

Given numbers are 2.00, 2.70 and 0.09

L.C.M. of 200, 270 and 9 is 5400.

L.C.M. Of given numbers = 54.00 = 54

Q 16.

Explanation:

945.341-1042.792+875.435+31.025 is the given expression

Here first consider the numbers before the decimal places

945-1042+875+31

Consider 1042 ≅ 1045. So we get approximate answer as

100+875+31=775+31=806
So answer can be Option B or D as they are > 800 and nearer
Now consider only last digit of the numbers given,
1+2+5+5=1+2+10=1+8=9
Out of B and D, Option D has 9 at end.
Answer = Option D = 809.009

Q 17.

Explanation:

$$\frac{74.6-38.9-5.7}{26.4-18.9}$$

$$=\frac{74+0.6-38-0.9-5-0.7}{26+0.4-18-0.9}$$

$$=\frac{74-38-5+0.6-0.9-0.7}{26-18+0.4-0.9}$$

$$=\frac{31-1.0}{8-0.5}=\frac{30}{7.5}=4$$

Q 18.

Explanation:

In the above expression number of decimals are 6.
Ignore the decimals and then multiply first
We will get 1×3×1×3=9
Now add 6 decimals
Answer = 0.000009
Note – Here we have 5 zeroes (5 decimals) and digit 9 as the 6th decimal

Q 19.

Explanation:

3 * 5 = 15. Sum of decimal places = 4.
0.003 * 0.5 = 0.0015 = 0.0015

Q 20.

Explanation:

0.535353..... = 0.53
= 53/99

Q 21.

Explanation:

$$5\frac{1}{5}+4\frac{1}{2}+4\frac{1}{3}$$

$$=5+4+4+\frac{1}{5}+\frac{1}{2}+\frac{1}{3}$$

$$=13+\frac{31}{30}=13+1\frac{1}{30}$$

$$=13+1+\frac{1}{30}=14+\frac{1}{30}$$

Q 22.

Explanation:

$$2 \times ? \cdot 6=\frac{676}{26}$$

$$\therefore 2 \times ? - 6 = 26$$

$$\therefore 2 \times ? = 32$$

$$\therefore ? = 16$$

Q 23.

Explanation:

Let integer be M

$$\therefore M - \frac{M}{3} = 10$$

$$\therefore M = 15$$

Q 24.

Explanation:

x/4 – (x - 3)/5 = 1
(5x – 4(x – 3))/20 = 1
5x - 4x + 12 = 20
x = 8

Q 25.

Explanation:

$(0.4)^2 + (0.2)^2 = \sqrt{?}$

$\therefore 0.16 + 0.04 = \sqrt{?}$

$\therefore 0.20 = \sqrt{?}$

Squaring both sides, we get,

$(0.2)^2 = ?$

$\therefore ? = 0.04$

Q 26.

Explanation:

Let the two numbers be 'a' and 'b'

Let, $\sqrt{a} = 3$

$\therefore a = 9$

$\therefore a^2 = 81$

Also it is given that, $a^2 + b^2 = 145$

$\therefore 9^2 + b^2 = 145$

$\therefore b^2 = 64$

$\therefore b = 8$

Q 27.

Explanation:

$(0.000001)^{\frac{1}{3}} = \sqrt[3]{0.000001}$

If a cube has 6 decimals, then its cube root will have 6/3 = 2 decimals

$\therefore \sqrt[3]{0.000001} = 0.01$

Q 28.

Explanation:

$2000^3 = 2000 \times \ldots$ 10 times

$2000 = 2 \times 1000$ i.e it has 3 zeroes.

So that means **3 zeroes x 10 times = 30**

Q 29.

Explanation:

Let $(15)^{3.5} * (15)^x = 15^8$

Then, $(15)^{3.5 + x} = (15)^8$

$3.5 + x = 8$

$x = (8 - 3.5)$

$x = 4.5$

Q 30.

Explanation:

$(3 \times 3 \times 3 \times 3 \times 3)^6 \div (3 \times 3 \times 3 \times 3)^7 \times 3^4$

$= 3^{6 \cdot 6} \div 3^{4 \cdot 7} \times 3^4$

That is $3^{36} \div 3^{28} \times 3^4$

As per BODMAS rule we must first solve division.

This will give us $3^{36-28} \times 3^4 = 3^8 \times 3^4$

$= 3^{12} = 3^{3 \cdot 4} = 27^4$

VERBAL REASONING

Following is a list of English words with meaning. You are advised to memorize all these words. All these words will be used in the next module

Word	Common Meaning
Accelerate	To speed up
Affluent	having a great deal of money; wealthy
Ailing	in poor health
Antlers	one of the solid deciduous horns, usually branched, of an animal of the deer family.
Argonauts	a small floating octopus, the female of which has webbed sail-like arms and secretes a thin coiled papery shell in which the eggs are laid.
Barren	(of land) too poor to produce much or any vegetation.
Blizzard	a severe snowstorm with high winds.
Bobbin	a small bar attached to a string used for raising a door latch.
Caribou	any of several large, North American deer
Choir	a company of singers
Clamps	a device, usually of some rigid material, for strengthening or supporting objects or fastening them together.
Connotative	A connotation is a commonly understood cultural or emotional association that some word or phrase carries, in addition to its explicit or literal meaning, which is its denotation.
Covenant	an agreement, usually formal, between two or more persons to do or not do something specified.
Crafty	clever at achieving one's aims by indirect or deceitful methods.
Crimson	deep purplish-red
Crochet	needlework done with a needle having a small hook at one end for drawing the thread or yarn through intertwined loops.
Dearth	an inadequate supply; scarcity; lack:
Disheveled	hanging loosely or in disorder
Dogmatic	asserting opinions in a doctrinaire or arrogant manner
Dolorous	full of, expressing, or causing pain or sorrow
Ebullience	high spirits; exhilaration; exuberance
Entomologist	the branch of zoology dealing with insects

Enumerated	to mention separately as if in counting
Exuberance	an instance of this
Fatuousness	foolish or inane
Fecund	producing or capable of producing offspring
Felicitous	well-suited for the occasion
Forthcoming	about to come
Fragile	easily broken
Gothic	Complex style of writing, painting, or architecture
Grizzly	an animal of a large race of the brown bear native to North America
Hooves	the horny part of the foot of an ungulate animal, especially a horse
Impermanence	not permanent or enduring; transitory.
Impudence	lack of modesty; shamelessness.
Incarcerated	to imprison; confine.
Indigence	seriously impoverished condition; poverty.
Indigent	poor; needy.
Indigent	needy; poor
Jurist	a person versed in the law, as a judge, lawyer, or scholar
Kiln	a furnace or oven for burning
Monotonous	dull, tedious, and repetitious; lacking in variety and interest.
Moose	a large, long-headed mammal
Mosaic	a picture or decoration made of small, usually colored pieces of inlaid stone, glass, etc.
Oboe	a woodwind instrument having a slender conical, tubular body and a double-reed mouthpiece.
Ornate	elaborately or sumptuously adorned, often excessively or showily so
Pact	an agreement, covenant, or compact
Peculiar	different to what is normal or expected; strange.
Phony	not genuine; fraudulent.
Pinnacle	the most successful point; the culmination.
Portaging	the act of carrying; carriage
Reel	a cylinder, frame, or other device that turns on an axis and is used to wind up or pay out something

Renaissance	the activity, spirit, or time of the great revival of art
Reservoir	a natural or artificial place where water is collected and stored for use
Sameness	lack of variety; uniformity or monotony.
Schematic	(of a diagram or other representation) symbolic and simplified.
Scorch	to affect the color, taste, etc., of by burning slightly
Shovel	an implement consisting of a broad blade or scoop attached to a long handle, used for taking up, removing, or throwing loose matter, as earth, snow, or coal
Spatial	relating to space
Stricken	seriously affected by an undesirable condition or unpleasant feeling.
Subpoena	the usual writ for the summoning of witnesses or the submission of evidence
Summons	a request, demand, or call to do something
Trait	a distinguishing quality or characteristic, typically one belonging to a person.
Treatise	a formal and systematic exposition in writing of the principles of a subject
Turquoise	an opaque mineral
Vertebrae	Animal having spinal column
Virtuoso	a person who has special knowledge or skill in a field
Wild	(of an animal or plant) living or growing in the natural environment; not domesticated or cultivated.

Basic Formulae:

1. $(a-b)^2 = (a^2 + b^2 - 2ab)$
2. $(a+b)^2 = (a^2 + b^2 + 2ab)$
3. $(a+b)(a-b) = (a^2 - b^2)$
4. $(a^3 + b^3) = (a+b)(a^2 - ab + b^2)$
5. $(a^3 - b^3) = (a-b)(a^2 - ab + b^2)$
6. $(a+b+c)^2 = a^2 + b^2 + c^2 + 2(ab+bc+ca)$
7. $(a^3 + b^3 + c^3 - 3abc) = (a+b+c)(a^2 + b^2 + c^2 - ab - bc - ac)$

Points to Remember

1) Sum of the first n odd numbers = n^2
2) Sum of first n even numbers = n (n + 1)
3) Even numbers divisible by 2 can be expressed as 2n, n is an integer other than zero.
4) Odd numbers which are not divisible by 2 can be expressed as 2(n + 1), n is an integer.

MODULE || 02

Analytical Reasoning

- Dealing Linear Ordering questions with solved Drills

Quantitative Reasoning.

- Algebra – evaluating expressions
- linear equation of first order
- quadratic equation
- Solved Practice Drill

Verbal Reasoning

- Analogies – Techniques and practice questions, Solved Practice Drill,

Vocabulary

- Vocabulary to memorize (This vocabulary will be used in solving verbal questions in the next module)

ANALYTICAL REASONING

DEALING LINEAR ORDERING QUESTIONS WITH SOLVED DRILLS

Linear ordering questions are the easiest questions, and fortunately, they appear the most often. They can be classified according to whether they order elements spatially or sequentially.

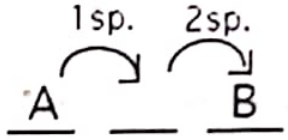
- Spatial questions
- Hybrid questions
- Sequential questions

Spatial Ordering

THE LINE-UP

As the term "line-up" suggests, these questions involve ordering elements in a line, from left to right or from front to back.

Before we begin, we need to study the vocabulary peculiar to these questions.

Condition	Meaning
A sits next to B.	Both conditions mean that no one sits between A and B. Although A is to the left of B in the text, that order cannot be assumed on the line. The phrase "immediately next to" is redundant; however, that style is often used on the HAT.
B sits immediately between A and C. B sits between and next to A and C. B sits directly between A and C.	All three conditions mean that no element separates B from A, nor B from C.
Two spaces separate A and B.	Students often confuse these two conditions. They do not mean the same thing. "A and B are two spaces apart" means that only one spot separates them. 
A and B are two spaces apart.	

Question Statement:

There are five people - Bushra, Nabeel, Danyal, Chawla, and Gharida - in a police line-up standing in spaces numbered 1 through 6, from left to right. The following conditions apply:

There is always one empty space.

Chawla is not standing in space 1, 3, or 5.

Gharida is the third person from the left.

Bushra is standing to the immediate left of Nabeel.

Analyzing the Conditions

Following the strategies developed earlier, we abbreviate the names by using the first letter of the name and then symbolize the conditions. *"Chawla is not standing in space 1, 3, or 5"* is naturally symbolized as

C ≠ 1, 3, 5. *"Gharida is the third person from the left"* is naturally symbolized as **G = 3rd**. Note: the fact that Gharida is third does not force him into space 3—he could stand in spaces 3 or 4. *"Bushra is standing to the immediate left of Nabeel"* is symbolized as **BN**.

Our diagram will consist of six dashed lines, numbered 1 through 6 from left to right. Summarizing

this information gives the following schematic:

Diagram I ___ ___ ___ G ___ ___

Diagram II ___ ___ G ___ ___ ___

B N D C G
C = 1, 3, 5
G = 3rd
BN

1 2 3 4 5 6

Now, we decide the most effective order for placing the elements on the diagram. Following the guidelines on page 31, we look for a condition that fixes the position of an element. There is none. Next, we look for a condition that limits the position of an element. The second condition, *"Gharida is the third person from the left,"* limits Gharida to spaces 3 and 4. This condition, as often happens with ordering questions, generates two diagrams: one with the empty space to Gharida's left and one with the empty space to his right:

(Note: D is "wild" because the conditions do not refer to him. Thus D can stand in more positions than any other person can.). This diagram is self-contained. There is no need to refer to the original problem. If possible, always avoid rereading the problem. No further conditions can be derived, so we turn to the questions.

Drill

1. Nabeel CANNOT stand in which one of the following spaces?

   A. 2 B. 3
   C. 4 D. 5
   E. 5

2. Which one of the following is a possible ordering of the 5 people from left to right?

   A. Chawla, empty, Danyal, Gharida, Bushra, Nabeel
   B. Bushra, Chawla, Nabeel, Gharida, Danyal, empty
   C. Danyal, Bushra, Gharida, Nabeel, empty, Chawla
   D. Danyal, Chawla, Gharida, empty, Nabeel, Bushra
   E. Bushra, Nabeel, Gharida, Chawla, Danyal, empty

3. If space 6 is empty, which one of the following must be false?

   A. Chawla stands in space 4.
   B. Danyal stands in space 4.
   C. Chawla is to the left of Nabeel.
   D. Chawla is to the right of Danyal.
   E. Nabeel stands in space 2.

4. Which one of the following spaces CANNOT be empty?

   A. 1 B. 2
   C. 3 D. 4
   E. 5

Solution

Q1.

The method of solution to this problem is rather mechanical: We merely place Nabeel in one of the spaces offered. Then check whether it is possible to place the other people in the line-up without violating any initial condition. If so, then we eliminate that answer-choice. Then place Nabeel in another space offered, and repeat the process.

To that end, place Nabeel in space 2 in Diagram

B N G ___ C ___

B N G ___ C ___

II:

From the condition BN, we know that B must be in space 1:

Now D could stand in space 4, and C could stand in space 6—both without violating any initial condition:

This diagram is consistent with the initial

B N G D X C (Where X means "empty")

conditions. So N *could* stand in space 2. This eliminates choice (A).

Next, place Nabeel in space 4. Then Diagram I is violated since G is already in space 4, and Diagram

II is also violated since there is no room for the

B?

__ __ G X __ __

condition **BN**:

The answer is (C).

Q2.

This problem is best solved by the method of elimination. To apply this method take a condition; test it against each answer-choice, eliminating any that violate it. Then take another condition; test it against the remaining answer-choices, eliminating any that violate it. Continue until only one answer-choice remains. Many students apply every condition to the first answer-choice, then every condition to the second answer choice, and so on. This should be avoided since it is inefficient; however, sometimes there is no other option. Because this question type is relatively easy, it often is the first or second question asked.

The first condition contradicts choice (A) since Chawla cannot be first. It does not contradict the other choices. So eliminate (A) only. The second condition contradicts choice (B) since Gharida must be 3rd. It does not contradict the remaining choices. So eliminate (B) only. The third condition contradicts choices (C) and (D) since in neither choice is Bushra to the immediate left of Nabeel. It does not contradict the remaining choice. So eliminate (C) and (D) only. Thus, by process of elimination, we have learned the answer is (E).

Q3.

The structure of this question is awkward—the correct answer will always make a false statement! The question is more tractable when rephrased as "All of the following could be true EXCEPT." Now, merely test each answer-choice against the initial conditions until you find the choice that violates one or more conditions.

Adding the supplementary condition, "space 6

Diagram I ~C __ ~C G ~C X

Diagram II ~C __ G __ ~C X

is empty," to the original diagrams gives

In Diagram I, the only space open for C is space 2:

Clearly, this diagram does not leave room for the condition **BN**. Therefore, we eliminate Diagram I.

Next, test each answer-choice against Diagram

__ __ G C __ X

II, starting with (A). Place Chawla in space 4 as follows:

Now the condition **BN** forces B and N into spaces 1 and 2, respectively, which in turn

B N G C D X

forces D into space 5. So our uniquely determined diagram is

This diagram does not violate any initial condition. Hence, Chawla could stand in space

~C __ G D ~C X

4. So eliminate choice (A).

Next, turning to choice (B), place Danyal in space 4:

The condition **BN** forces B and N into spaces 1

B N G D __ X

and 2, respectively:

However, this diagram forces C into space 5, violating the condition **C ≠ 1, 3, 5**. Hence, D cannot stand in space 4, and the answer is (B).

Q4.

Assume that space 1 is empty. Then in Diagram I, the condition BN can be placed in spaces 2 and 3, D can be placed in space 5, and C can be

_X_ B _X_ G D C

placed in space 6—all without violating any initial condition:

Thus, space 1 *could be* empty. This eliminates (A).

Next, assume that space 2 is empty. In Diagram

__ _X_ __ G B _X_

I, this forces **BN** into spaces 5 and 6:

However, this diagram does not leave room for C (recall **C ≠ 1, 3, 5**). Diagram I is thus impossible when space 2 is empty. Turning to Diagram II, we see immediately that space 2 cannot be empty, for this would make G second, violating the condition **G = 3rd**. Hence, Diagram II is also impossible when space 2 is empty. Thus, space 2 *cannot* be empty, and the answer is (B).

Drill

Question 1 to 6 are based on following statement

Preschoolers Amna, Basra, Chand, Dani, Ehsan, Faiz, and Gama all require Basket Ball lessons this week.

The Basket Ball teacher can see one student per day from Monday through Sunday.

The order in which the students are seen is determined by the following constraints:

Basra is seen on the day after Amna.

Dani is seen later in the week than Gama and Amna.

Gama is seen later in the week than Amna.

Ehsan is seen two days after Basra is seen.

Questions

1. Which of the following could be an order in which the students are seen from Monday to Sunday?

   A. Amna, Basra, Dani, Ehsan, Faiz, Gama, Chand.
   B. Faiz, Chand, Amna, Basra, Gama, Dani, Ehsan.
   C. Chand, Amna, Basra, Gama, Ehsan, Faiz, Dani.
   D. Amna, Faiz, Chand, Basra, Gama, Ehsan, Dani.
   E. Basra, Amna, Gama, Ehsan, Dani, Chand, Faiz.

2. If Basra is seen on Wednesday then which of the following must be true?

   A. Faiz is seen on Monday
   B. Chand is seen on Thursday.
   C. Gama is seen on Saturday.
   D. Ehsan is seen on Friday.
   E. Basra is seen on Tuesday.

3. If Ehsan is seen on Saturday, then which of the following must be true?

   A. Faiz is seen on Monday.
   B. Dani is seen on Sunday.
   C. Basra is seen on Wednesday.
   D. Chand is seen on Monday.
   E. Gama is seen on Tuesday.

4. Which is the latest day in the week that Amna can be seen?

   A. Tuesday
   B. Wednesday
   C. Thursday
   D. Friday
   E. Saturday

5. If Basra is seen on Wednesday, then which of the following must NOT be true?

   A. Dani is seen on Saturday and Gama is seen on Thursday.

B. Faiz is seen on Saturday and Chand is seen on Sunday.
C. Amna is seen on Tuesday and Ehsan is seen on Friday.
D. Chand is seen later in the week than Ehsan.
E. Ehsan is seen on a consecutive day with Faiz.

6. If Amna is seen on Wednesday, then for how many students do you know the exact days that they learn Basket Ball?

A. three
B. four
C. five
D. six
E. seven

Question 7 to 12 are based on following statement

Javaid and his Argonauts pilot their boat toward Neelam Lake. In order to maximize rowing efficiency, Javaid has organized his Argonauts - Aneela, Basheer, Charli, Danial, Eyan, Fraz, and Gama - along the rowing positions from the front to the back of the boat. The seat at the front of the boat is ranked first, and the seat farthest back is ranked seventh.

The rowing position of each Argonaut is determined by the following:

If Charli rows fourth, then Gama rows in seventh position and Basheer rows in fifth.

If Aneela does not row second, then Basheer rows in sixth position and Danial rows in second.

Fraz rows in the position immediately after Basheer.

7. Which of the following could be an order of the Argonauts?

A. Aneela, Danial, Eyan, Charli, Gama, Basheer, Fraz.
B. Basheer, Aneela, Gama, Charli, Eyan, Fraz, Danial.
C. Eyan, Aneela, Danial, Basheer, Fraz, Gama, Charli.
D. Danial, Aneela, Eyan, Charli, Gama, Basheer, Fraz.
E. None of the above.

8. If Charli does not row fourth, then which of the following must be true?

A. Basheer rows sixth.
B. Aneela rows second.
C. Eyan rows first or second.
D. Danial rows fifth or sixth.
E. None of the above.

9. If Charli rows fourth, then which of the following must be true?

A. Aneela rows second.
B. Danial rows third.
C. Eyan rows first.
D. Gama rows third.
E. None of the above.

10. If Eyan and Danial row before Aneela, then which of the following must NOT be true?

A. Gama rows first and Charli rows fifth.
B. Aneela rows third and Gama rows fifth.
C. Basheer rows sixth and Fraz rows seventh.
D. Eyan rows first and Danial rows second.
E. None of the above.

11. Which position could the fewest number of people potentially go in?

A. 1
B. 2
C. 3
D. 5
E. 7

12. If Eyan rows first and Danial rows third, then how many possible configurations of the Argonauts are there?

A. Two
B. Three
C. Four
D. Five
E. Six

Question 13 to 18 are based on following statement

A number of secret agents desire to be sent on a mission to Kazakhstan. The agents' names are Aziz, Bala, Chaman, Danish, Ehsan, Fariha, and Gull. Each agent is required to schedule an interview this week from Monday to Sunday in order to have a background check. Only one agent can receive a background check per day, and all agents will receive background checks this week.

The order in which the agents are seen is determined by the following:

Chaman is seen on Wednesday.

Danish is seen on a day consecutive with Ehsan.

If Gull is seen later in the week than Danish, then Fariha is seen on Saturday and Bala is seen on Sunday.

If Aziz is seen earlier in the week than Ehsan, then Bala is seen on Saturday and Fariha is seen on Sunday.

Gull is seen on a day consecutive with Aziz.

13. Which of the following is an order in which the agents could be seen?

A. Danish, Ehsan, Chaman, Aziz, Gull, Bala, Fariha.
B. Aziz, Gull, Chaman, Ehsan, Danish, Bala, Fariha.
C. Danish, Chaman, Ehsan, Gull, Aziz, Fariha, Bala.
D. Gull, Aziz, Chaman, Danish, Bala, Ehsan, Fariha.
E. Fariha, Bala, Danish, Ehsan, Chaman, Gull, Aziz.

14. If Gull is seen on Friday, then for how many people do you know the exact day they are seen?

A. two
B. three
C. four
D. five
E. six

15. If Bala is seen before Fariha, then which of the following must be true?

A. Gull is seen earlier in the week than Danish.
B. Aziz is seen on Monday and Gull is seen on Tuesday.
C. Chaman is seen earlier in the week than Aziz.
D. Bala and Danish are seen on consecutive days.
E. Gull and Aziz are not seen on consecutive days.

16. Which of the following is a pair of people either of whom could be seen on Thursday?

A. Fariha, Gull
B. Ehsan, Bala
C. Aziz, Danish
D. Chaman, Ehsan
E. Bala, Fariha

17. If Gull is seen earlier in the week than Aziz, then which of the following could be true?

A. Gull is seen on Friday.
B. Aziz is seen on Monday.
C. Gull is seen on Tuesday.
D. Aziz is seen on Thursday.
E. Bala is seen on Sunday.

18. If Chaman is seen on days consecutive with Aziz and Danish, then which of the following must NOT be true?

A. Bala is seen on Sunday.
B. Aziz is seen on Friday.
C. Fariha is seen on Sunday.
D. Danish is seen on Tuesday.
E. Gull is seen on Monday.

SOLUTIONS

Hint for Explanation Question 1 to 6

Transcribe the Constraints

1. Box Rule— [A B]

2. Sequencing Rule— A < G, G < D (A → G, A → D)
3. Sequencing Rule— A < G
4. Box Rule— [B __ E]

You should notice that the two box rules can be added in order to make the following box rule, which is very "burdensome," that is, it greatly restricts the number of possible arrangements of the variables.

[A B __ E]

The two sequencing rules can be consolidated to form:

A < G < D

Is there a burdensome constraint? Yes, there is. So you should keep in mind that **four** spots are taken by the A, B, and E box in a game with only **seven** positions. You should now draw the four possible scenarios:

A B __ E __ __ __

__ A B __ E __ __

__ __ A B __ E __

__ __ __ A B __ E

Write Out the Vacancy-Occupancy Rules

Draw in vacancy rules for each possible scenario.

A B __ E __ __ __
(not D in the 3rd position)

__ A B __ E __ __
(not D, not G in the 1st position; not D in the 4th position)

__ __ A B __ E __
(not D, not G in the 1st and 2nd positions; not D in the 5th position)

__ __ __ A B __ E
(not D, not G in the 1st, 2nd and 3rd positions; not D in the 6th position)

Draw in double possibilities and other occupancy rules.

In the third scenario, it is clear that D must go on Sunday and G must go on Friday since there is nowhere else for them to go. This leaves only two places for C and F, so draw in that double possibility. In the fourth scenario, there is nowhere for D to go, so it becomes apparent that this scenario is impossible and that A cannot go later than Wednesday.

Eliminate repetitive rules.

You should now clean up your diagram by eliminating the vacancy rules for D and G in scenario 3, since you know where D and G are in that scenario. In addition, you should delete scenario 4 entirely.

Make Deductions from the Diagram. There are no deductions that you can make from this diagram. Just be sure to have the final diagram handy when answering the questions.

1. A B __ E __ __ __
(not D in the 3rd position)

2. __ A B __ E __ __
(not D, not G in the 1st position; not D in the 4th position)

3. C/F F/C A B G E D

Q.1

Which of the following could be an order in which the students are seen from Monday to Sunday?

(C) The order has to correspond to one of the three scenarios above. This one corresponds to scenario 2.

(A) Dani cannot go before Gama.

(B) Only one person can be between Basra and Ehsan.

(D) Basra must immediately follow Amna.

(E) Basra must immediately follow Amna.

Q2.

Basra is seen on Wednesday, then which of the following must be true?

(D) If this happens, you are in scenario 2, and Ehsan must be seen on Friday.

Q3.

If Ehsan is seen on Saturday, then which of the following must be true?

(B) This occurs in scenario 3, in which Dani is seen on Sunday.

Q4.

Which is the latest day in the week that Amna can be seen? (B) This corresponds to scenario 3, which shows that Amna can be seen on Wednesday. If you did not draw in your vacancy rules correctly, then you might not have deduced that scenario 4 is impossible.

Q5.

If Basra is seen on Wednesday, then which of the following must NOT be true? **(B)** If Basra is seen on Wednesday, then you are in scenario 2. If Chand and Faiz are both seen on the weekend, then Dani would be forced into a position that would break a constraint.

Q6.

If Amna is seen on Wednesday, then for how many students do you know the exact days that they learn Basket Ball?

(C) This corresponds to scenario 3, where you know the exact positions of Amna, Basra, Gama, Ehsan, and Dani.

Hint for Explanation question 7 to 12

1. Transcribe the Constraints

1. The first two constraints can be transcribed as sufficient-necessary statements and their contrapositives:

a. $C_2 \rightarrow G_7$; b. $\sim G_7 \rightarrow \sim C_2$

a. $C_2 \rightarrow B_5$; b. $\sim B_5 \rightarrow \sim C_2$

2. a. $A_2 \rightarrow B_6$; b. $\sim B_6 \rightarrow \sim A_2$

a. $A_2 \rightarrow D_2$; b. $\sim D_2 \rightarrow \sim A_2$

3. The third constraint can be transcribed as a box rule:

2. Draw the Scenarios

Is there a burdensome constraint?

Yes, there are very burdensome sufficient-necessary rules, and these should be mapped out underneath the linear continuum. For every sufficient condition, you should put an asterisk underneath the slot where the condition would be invoked. Take a look at the following example. If A is not in slot 2, as stated in 3.a. and 4.a., then a condition will be invoked. If C is in slot 4, as stated in 1.a. and 2.a., then a sufficient necessary condition will be invoked. You should note

these statements in the following fashion:

— ☆A — ☆C — — — —

It is also a good idea to note the sufficient conditions of the contrapositives:

☆A ☆C ☆B ☆B ☆G
☆D

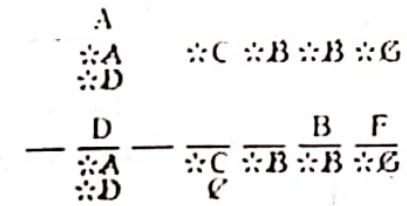
Now you will be able to remember what conditions will occur due to the placement of the variables within the game.

3. Write Out the Vacancy-Occupancy Rules.

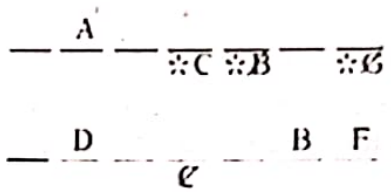
Draw in vacancy rules for each possible scenario.

Looking at the sufficient-necessary constraint regarding variable A and slot 2, you can see that if A is not in slot 2, then D must be in slot 2. This means that either A or D must be in slot 2. This can be noted with a double possibility or by drawing the two scenarios. In this case, do the latter.

Draw in double possibilities and other occupancy rules.



You know that F goes last in the second scenario because of your box rule. *Eliminate repetitive rules.* Since you have found the places of several variables in each scenario, you can delete several sufficient- necessary notes in each scenario. Additionally, you have learned of a vacancy rule for the second scenario—C cannot go fourth when D is second. So delete the irrelevancies:



Sit back and think of why each deleted condition is now irrelevant. After doing several of these problems, you will be able to make these deletions intuitively.

4. Make Deductions from the Diagram.

Unfortunately, there are no more deductions that you can make from our diagram at this point. You will have to wait for constraints within questions to find variables' exact positions.

Q7.

Which of the following could be an order of the Argonauts?

(C) This configuration is possible.

(A) If Charli is fourth, then Gama is seventh and Basheer is fifth.

(B) Fraz must go immediately after Basheer.

(D) If Charli is fourth, then Gama is seventh and Basheer is fifth.

(E) **C** is the correct answer.

Q8.

If Charli does not row fourth, then which of the following must be true?

(E) Charli not rowing fourth does not tell you anything about the rest of the game.

Question 3: If Charli rows fourth, then which of the following must be true?

(A) If Charli rows fourth, then Aneela must row second, Basheer must row fifth, Fraz sixth, and Gama seventh.

Q9.

If Eyan and Danial row before Aneela, then which of the following must NOT be true?

(B) This constraint means that Aneela cannot row second, so Danial must row second. This occurs in the second scenario. In this scenario, if Aneela rowed third and Gama rowed fifth, then that would force Eyan to row first. The only space left for Charli would be the fourth position, which would force the game to a contradiction.

Q10.

If Eyan and Danial row before Aneela, the which of the following must NOT be true?

(B) This constraint means that Aneela cannot row second, so Danial must row second. This occurs in the second scenario. In this scenario, if Aneela rowed third and Gama rowed fifth, then that would force Eyan to row first. The only space left for Charli would be the fourth

position, which would force the game to a contradiction.

Q11.

Which position could the fewest number of people potentially go in?

(B) This is the second position—only Aneela or Danial could go there.

Q12.

If Eyan rows first and Danial rows third, then how many possible configurations of the Argonauts are there?

(D) This constraint puts you in the first scenario. You should draw out the configurations for the BF box after putting what you know into the diagram.

E A D B F C/G G/C
⁙C ⁙B ⁙G

E A D C/G B F G/C
⁙C ⁙B ⁙G

E A D G C B F
⁙C ⁙B ⁙G

Counting the possible configurations of the diagram, you find that there are five possible scenarios. Each scenario with a double possibility counts twice.

Hint for Explanation Question 13 to 18

Transcribe the Constraints

Direct Placement: C = Wednesday

Box Rule: [D E]

Box Rule: [G A]

Sufficient Necessary:

$D < G \rightarrow F_{Sat}$; $\not{F}_{Sat} \rightarrow G < D$

$D < G \rightarrow B_{Sun}$; $\not{B}_{Sun} \rightarrow G < D$

In a contrapositive that includes sequencing, the sequencing is reversed instead of the sign being switched.

Sufficient Necessary:

$A < E \rightarrow B_{Sat}$; $\not{B}_{Sat} \rightarrow E < A$

$A < E \rightarrow F_{Sun}$; $\not{F}_{Sun} \rightarrow E < A$

Draw the Scenarios.

Is there a burdensome constraint?

Yes. Box rules, especially when they are placed in the mix with direct placement constraints, almost always mean that the game has a limited number of scenarios, which you can figure out quickly and which will be instrumental in finding the answers to the questions. Here are the scenarios that you should immediately draw out:

1. A/G G/A C D/E E/D B F
2. D/E E/D C A/G G/A F B
3. B/F F/B C A/G G/A D/E E/D
4. B/F F/B C D/E E/D G/A A/G

When you analyze the above scenarios with your sufficient-necessary conditions, you realize that one of the two boxes has to go before C. This makes scenarios 3 and 4 impossible. Here is why: In scenario 3, A < E, but B and F cannot go on the weekends to complete the mandates of the constraint. In scenario 4, D < G, but B and F cannot go on the weekends here either to fulfill the sufficient-necessary constraint's requirements. Therefore, the only two possibilities for the game are the first two scenarios.

Write Out the Vacancy-Occupancy Rules. You have already drawn in the occupancy rules through the use of double possibilities. Therefore, it is not necessary to write out any vacancy rules.

Make Deductions from the Diagram. Your diagram corresponds to the following:

A/G G/A C D/E E/D B F

D/E E/D C A/G G/A F B

There are no deductions left for you to make. It would be a bad idea to rely on anything in these circumstances.

If you haven't found the answer and there are no more deductions to make, then it would be wise to rework the problem.

Q13.

Which of the following is an order in which the agents could be seen?

(B) This is a possible order. (A) If Fariha is not seen on Saturday, then Gull must be seen before Danish.

(C) Chaman must be seen on Wednesday.

(D) If Bala is not seen on Saturday, then Ehsan must be seen before Aziz.

(E) Chaman must be seen on Wednesday.

Q14.

If Gull is seen on Friday, then for how many people do you know the exact day they are seen?

(D) This is possible only in scenario 2. We know the position of C, A, G, F, and B.

Q15.

If Bala is seen before Fariha, then which of the following must be true?

(A) This constraint puts Bala on Saturday and Fariha on Sunday, which occurs in scenario 1. Gull must be seen earlier in the week than Danish.

Q16.

Which of the following is a pair of people either of whom could be seen on Thursday?

(C) The variables D, E, A, and G could all be seen on Thursday. F, B, and C cannot be seen that day.

Q17.

If Gull is seen earlier in the week than Aziz, then which of the following could be true?

(E) This constraint can occur in either scenario, so you must look for an answer choice that does not conflict with your diagrams and the question's constraint of G < A.

Q18.

If Chaman is seen on days consecutive with Aziz and Danish, then which of the following must NOT be true?

(B) Aziz must be seen on Thursday or Tuesday to be consecutive with Chaman, who can be seen only on Wednesday.

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QUANTITATIVE REASONING

ALGEBRAIC EXPRESSIONS

You may have heard or read phrases like these before: "Simplify the expression" and "Solve the equation for x." Well, what is the difference between an expression and an equation?

It's simple: equations have equals signs, and expressions don't. Or, more formally: an equation is composed of two mathematical expressions joined by an equals sign.

$2(x + 1) - 1$
$2(x + 1) + 1 = 2x + 2 + 1 = 2x + 3$
is an expression. Given this expression by itself it is not possible to solve for x. It would be possible to simplify the way the expression is written like:

Now, 11 is also an expression. We can create an equation out of these two expressions by joining them with an equals sign: $2x + 3 = 11$
Now we have something solvable, using some simple algebra we can solve this equation for x:

$2x + 3 = 11$ subtract 3 from both sides
$\rightarrow 2x = 8$ divide both sides by 2
$\rightarrow x = 1$

Simplifying Algebraic Expressions

Rule 1

The simplest rule is: when you have different coefficients in front of the same variable, these coefficients can be added or subtracted.

Example:

3x + 8x = 11x, because 3 + 8 = 11
7y – 3y = 4y, because 7 - 3 = 4

Rule 2

Always separate common factors.

Example:

6x + 18 = 6 (x + 3) because 6 is common to both 6 and 18

Rule 3

When multiplying algebraic expressions, each term of the first expression is multiplied by each term of the second expression. The results of these multiplication operations are then added together. This is also known as the F.O.I.L. (First, Outer, Inner, Last) method.

Example:

(4x + 7) (x + 8) =
(4x)(x) + (4x)(8) + (7)(x) + (7)(8) =
4x2 + 32x + 7x + 56 =
4x2 + 39x + 56

Rule 4

Keep these useful formulas in mind:

$(a + b)^2 = a^2 + 2ab + b^2$
$(a - b)^2 = a^2 - 2ab + b^2$
$a^2 - b^2 = (a + b)(a - b)$

For example, you may be asked to calculate a seemingly difficult expression, such as: $71^2 - 29^2$

You could work this out by doing all the multiplication, but it may take some time. However, if you apply rule 4 [$a^2 - b^2 = (a + b)(a - b)$] you'd have:

$71^2 - 29^2$
= (71 + 29) (71- 29)
= (100) (42)
= 4,200

Example

$\frac{x^2-16}{2x+8} = \frac{(x-4)(x+4)}{2(x+4)}$

The (x + 4) terms in both the numerator and denominator cancel out, giving you:

$= \frac{x-4}{2}$

Substituting Values into Expressions

Some questions on the HAT test will ask you to substitute numerical values in for the variables of an expression. For example:

If $x=2$, what is the value of $\frac{x^2-2}{x-1}$?

To compute the value of the expression we would insert 2 into the expression everywhere an x appears, then we would simplify the expression by multiplying and adding the terms.

$$\frac{2^2-2}{2-1} = \frac{4-2}{2-1} = \frac{2}{1} = 2$$

So when x=2, the expression has a value of -3.

Here's an example where we must substitute two values:

If $a = 9$, and $b = 5$, simplify $\frac{a+b}{a-b}$

The question asks us to substitute 9 for 'a' and 5 for 'b', then simplify the fraction:

$$\frac{9+5}{9-5} = \frac{14}{4} = \frac{7}{2}$$

Word problems can be a little trickier, but the general approach to solving them is the same. Here's an example:

Topic Drill

1. If p = 2, q = 1 and r = 3 then $\frac{2pq + 3p}{2[(5pqr + 2p) - 3pr]}$ is
   A. 5/16 B. 5/6
   C. 3/7 D. 2/3

2. If a = 20, b = 35 and c = 5 then $\frac{4a + b}{c}$ is
   A. 23 B. 115
   C. 53 D. 43

3. If a = 2, b = 4 and c =3 then 2ac [(2b + 3c)-c] is
   A. 132 B. 51
   C. 168 D. 204

4. In value 200x, variable is
   A. 10 B. 200
   C. x D. 10(20)

Answers and Explanation:

Q 1.

Correct Answer is A

If p = 2, q = 1 and r = 3 then $\frac{2pq + 3p}{2[(5pqr + 2p) - 3pr]}$ is

Inserting Values in the expression

$$\frac{2\times2\times1 + 3\times2}{2[(5\times2\times1\times3 + 2\times2) - 3\times2\times3]}$$

$$= \frac{4+6}{2[(34) - 18]} = \frac{10}{2[16]} = \frac{10}{32} = \frac{5}{16}$$

Q 2.

Correct Answer is A

Inserting values in the expression

$$= \frac{4\times20 + 35}{5}$$

$$= \frac{80 + 35}{5}$$

$$= \frac{115}{5}$$

$$= 23$$

Q 3.

Correct Answer Is C

Inserting the values in the expression

$$= 2 \times 2 \times 3 [(2 \times 4 + 3 \times 3) - 3]$$

$$= 12 [8 + 9 - 3]$$

$$= 12 \times 14$$

$$= 168$$

Q 4.

Correct Answer is C

The only unknown value in the expression is x.

LINEAR EQUATION OF FIRST ORDER

A linear equation is one where all the variables (unknowns) are only raised to the first power.

$x + 1 = 10$ is a linear equation

$x^2 + 1 = 10$ is not a linear equation

Linear equations can also have multiple variables, like: $x - 2y = 8$.

Algebra questions on the HAT Test cover linear equations in both one and two variables. We'll cover both cases.

Maintaining Equation Equality

Given any equation, if you multiply, divide, add, or subtract the same number on both sides, the equality of your new equation will hold. You can also raise both sides to the same power and keep equality.

As long as we do the same thing on both sides the equality of the equation will still be true. If we add a variable to the equation the rule holds. Observe:

$$x = 2$$
$$3x = 6$$
$$3x + 1 = 7$$

We multiplied both sides by 3 then added 1 to both sides, and you can easily substitute 2 in for x to check that the equality holds true. You could also start with the last equation and reverse those steps to reach the first equation, which is what we'll be doing in this lesson.

Solving Linear Equations in One Variable

Solving a linear equation in one variable means finding the value of the variable; this involves performing the same operations to both sides of an equation to maintain equality while working to isolate the variable on one side of the equation. In this example we solve for the variable x:

Being careful to perform each operation correctly is important, but the key to solving linear equations is figuring out which operation to perform next. Here's a list of the usual order you'll follow:

1. Distribute if necessary
2. Combine like terms if necessary
3. Add or subtract to move all x terms to one side
4. Add or subtract to move constants to the side opposite x
5. Divide both sides by the coefficient of x

Often times some of the steps will not be necessary. In the above example we used Step 1, then Step 3, then Step 4, then Step 5. Here's an example using only steps 4 and 5.

$$4x + 3 = 11$$
$$4x = 8$$
$$x = 2$$

When fractions are thrown into the mix the rules are the same but there are a couple things to note. In step 5 dividing by a fraction is computed by multiplying by the inverse of the fraction (remember $\frac{3}{2}$ $\frac{2}{3}$ the fraction rules? to divide by we multiply by . Because of the difficulty of finding a common denominator, it will sometimes save time to perform step 5 before step 4. This is optional and the following example will demonstrate:

$\frac{1}{3} + \frac{1}{6} = \frac{3}{10}$ set 4

$\frac{1}{3}x = \frac{3}{10} - \frac{1}{6}$ Find common denominator subtract and simplify

$\frac{1}{3}x = \frac{18}{60} - \frac{10}{60} = \frac{8}{60} = \frac{2}{15}$ set 5

$x = \frac{6}{15} = \frac{2}{5}$

Solving this problem becomes simpler if we reverse the order of steps 4 and 5.

Whichever way you go you should arrive at the same answer.

Practice Questions

Solve for the missing variable.

1	$5x + 7 = 52$	$5x = 52 - 7$ $X = 45/5 = 9$
2	$3x - 4 = x - 8$	$3X - x = -8 + 4$ $2X = -4$ $X = -4/2$ $X = -2$
3	$4x + 10 = 7x - 17$	$4x - 7x = -17 - 10$ $-3x = -7$ $3x = 7$ $X = 7/3$
4	$3(3-h) = 5h + 16$	$24 - 3h = 5h + 16$ $-3h - 5h = 16 - 24$ $-8h = -8$ $-h = -1, h = 1$
5	$10x - 7 = 5(x + 1)$	$10x - 7 = 5(x + 1)$ $10x - 7 = 5x + 5$ $10x - 5x = 5 + 7$ $5x = 12$ $X = 12/5$
6	$2x - \frac{10}{3} = \frac{5}{6}$	$2x = \frac{5}{6} + \frac{10}{3}$ $2x = \frac{5+20}{6}$ $2x = \frac{25}{6}$ $X = \frac{25}{12}$

Converting Statement to Equation

Often times the most difficult part of solving a word problem is figuring out how to set up the correct equation from the words. Instead of being giving a clear equation to solve like this:

$$S = 12\left(0.80\left(3{,}000 - 1{,}300\right)\right),$$

You're given a paragraph like this:

Statement

Javeria wants to start saving money to buy a house. She needs to spend Rs.1,3000 a month to cover all of her basic living expenses (food, rent, utilities, insurance). She plans to save 80% of all the money that she doesn't need to spend on her basic living expenses. If Javeria earns Rs.3,0000 a month, how much will she save in a year?

Conversion

The equation for solving Javeria's annual savings is the one we gave above. (30,000 – 13000) is the amount of money Javeria will have left over each month after covering her basic living expenses. 0.80 is the percentage of this left over money that Javeria wants to save.

Her saving per month will be: [0.80(30,000 – 13000)]

And, finally since 12 is the number of months in a year, we multiply these three expressions together to get the amount of money Javeria will save in a year, which we call S:

$$S = 12 \times [0.80(30{,}000 - 13000)]$$

$$S = 12 \times 0.80\ (17000)$$

$$S = 12 \times 13600$$

$$S = 163200$$

Equation in Two Variables

To solve a linear equation in two variables you need to have two distinct equations.
Given $2x - y = 9$ we can only solve for x or y in terms of the other variable:

$$x = \frac{y+9}{2}$$

$$y = 2x - 9$$

If we add the equation $3y - x = -2$ we now have a system of two equations in two variables, and it is possible to solve for numerical values of x and y.

System of equations:

$$2x - y = 9$$
$$3y - x = -2$$

There are several ways to solve a system of equations like this one, but we will focus on using substitution. This is similar to the substitution we did in an earlier lesson, but will involve two steps.

For the first step we need to solve one equation for one variable in terms of the other variable. There will be four different ways to do this depending on which equation and variable you choose; go whichever route is the easiest. Two of the possibilities are given above, and we will choose $y = 2x - 9$. Since this was derived from the first equation, we will substitute this into the second equation. We do this by replacing the y in $3y - x = -2$ with $2x - 9$, to get:

$$3(2x - 9) - x = -2$$

We now have a linear equation in one variable, which we know how to solve:

$$3(2x - 9) - x = -2$$
$$6x - 27 - x = -2$$
$$5x = 25$$
$$x = 5$$

Now we have solved the value of x, and we can find y by substituting x=5 into either of the original equations. Using the first equation we'd have:

$$2x - y = 9$$
$$2(5) - y = 9$$
$$10 - y = 9$$
$$y = 1$$

If we had chosen to substitute x=5 into the second equation, we would get the same answer:

$$3y - x = -2$$
$$3y - 5 = -2$$
$$3y = 3$$
$$y = 1$$

Now we have our solution set of $x = 5$ and $y = 1$; this will often be written as the 'ordered pair' $(x, y) = (5, 1)$, or simply as $(5, 1)$.

PRACTICE QUESTIONS

Solve the system of equations.

1	$x + y = 3$, $2y - 1 = -x$	By Solving first equation for x in terms of y: X = 3 – y Now insert this value of x in second equation 2y – 1 = -(3 – y) 2y – 1 = -3 + y 2y – y = -3 + 1 Y = -2 (we have found the value of y) Now insert this value of y in first equation X + (-2) = 3 X – 2 = 3 X = 3 + 2 = 5 (we have found the value of x)
2	$x + 2y = 5$ $2y - 3x = 1$	Solving first equation for x X = 5 – 2y Insert this value of x in the second equation 2y – 3(5 – 2y) = 1 2y -15 + 6y = 1 8y = 1 + 15 Y = 16/8 = 2 (we have found the value of y) Now insert this value of y in first equation X + 2(2) = 5 X + 4 = 5 X = 5 - 4 = 1 (we have found the value of x also)

Topic Drill

1. Variables of linear equation is implicitly raised to

   A. first power B. second power
   C. third power D. four power

2. Example of linear equation involving two variables is

   A. $7x + 3y + 4z = 20$
   B. $6x + 2y = 10$
   C. $8x = 2+10$
   D. $7a + 8b + 9c = 10 + 5$

3. In linear equation $ax + by = c$. Which of the following is correct about a, b and c?

   A. variable B. constants
   C. zero D. real numbers

4. In linear equation $ax + by = c$ where c is an integer greater than 1, then a and b cannot be

   A. equal to positive Real numbers
   B. equal to one
   C. equal to zero
   D. equal to even numbers

5. Solve the following equation for x and y

   $X + 4y = 60$ and $2x + 5y = 30$

   A. $x = -60$ and $y = 30$
   B. $x = 30$ and $y = -60$
   C. $x = 30$ and $y = 60$
   D. $c = 60$ and $y = -30$

SOLUTIONS

Q 1.

Correct Answer is A

The exponents of variables in linear equation is one.

Q 2.

Correct Answer is B

X and y are two variables in the option B equation.

Q 3.

Correct Answer is B

X and y are variables and a, b, and c are constants.

Q 4.

Correct Answer is C

If a and b are zero then left side of the equation will be zero which cannot be equal to a number greater than 1.

Q 5.

Correct Answer is A

$X + 4y = 60$ and $2x + 5y = 30$

Solving first equation for x, we have $x = 60 - 4y$

Inserting this value of x in the second equation

$2(60 - 4y) + 5y = 30$

$120 - 8y + 5y = 30$

$120 - 3y = 30$

$-3y = 30 - 120$

$-3y = -90$

$Y = 30$ (Now we have value for y)

Inserting value of y in the first equation

$X + 4 \times 30 = 60$

$X + 120 = 60$

$X = 60 - 120$

$X = -60$ (This is the value for x)

QUADRATIC EQUATION

A quadratic equation is in the form of $ax^2 + bx + c = 0$. Notice that the first term in this equation is x raised to a power of 2, or squared. Therefore, by definition, that is a quadratic

equation. You may have to solve such an equation, or, in other words, determine values for x.

One way to solve a quadratic equation is to use the quadratic formula. This is given as:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Where a is the coefficient for x^2, b is the coefficient for x, and c is the coefficient without the variable. and $a \neq 0$

Example

Solve the equation $6x^2 + 11x - 35 = 0$ for x.

where we see that $a = 6$, $b = 11$, and $c = -35$, and solving the quadratic equation we get:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-11 \pm \sqrt{121 + 840}}{12} = \frac{-11 \pm 31}{12}$$

Which means that there are two possible solutions: one when the plus sign is used and the other when the negative sign is used. The solutions are (-42/12) and (20/12).

Solving Quadratic Equations by Factoring

Some quadratic equations can be solved more quickly by factoring. For example, the quadratic equation x2 + 7x + 10 = 0 can be factored as(x + 2) (x + 5) = 0

When a product is equal to 0, at least one of the factors must be equal to 0, which leads to two cases: x + 2 = 0 or x + 5 = 0. We then get two values for x.

Topic Drill

1. Find the one of the solutions for the quadratic equation: $4x^2 + 26x + 12 = 0$

   A. -3 B. -6
   C. 3 D. 6

2. Solution of a quadratic equation $x^2 + 5x - 6 = 0$

   A. x = 3, -2 B. x = -2, 3
   C. x = 2, 3 D. x = -2, -3

3. Solve $x^2 - 3x = -3$ for values of x.

   A. 1, 3 B. 6, 7
   C. 1, 6 D. 3, 6

4. If $x^2 + 5 = -6x$, then what is the value of x?

   A. 5, 1 B. 10, 5
   C. -5, -1 D. 1, -7

5. $x^2 - 2x = 8$. Solve for x

   A. 4, 3 B. 2, 5
   C. 5, 4 D. 4, -2

SOLUTIONS

Q 1.

Correct Answer is B

$$x = \frac{-26 + \sqrt{(26)^2 - 4(4)(12)}}{2(4)}$$

$$= \frac{-26 + \sqrt{484}}{8}$$

$$= \frac{-26 + 22}{8}$$

$$= -\frac{1}{2}$$

$$x = \frac{-26 - \sqrt{(26)^2 - 4(4)(12)}}{2(4)}$$

$$= \frac{-26 - \sqrt{484}}{8}$$

$$= \frac{-26 - 22}{8}$$

$$= \frac{-48}{8}$$

$$= -6$$

Answer: $: x = -6, x = -\frac{1}{2}$

Q 2.

Correct Answer is D

Rewrite the quadratic equation in factor form: x2 + 5x + 6 = (x +...)(x +...)
Determine the values to fill the slots, so that on adding these value it yields 'b' or in our example 5 and on multiplying these values it yields 'c' i.e. here it yields 6. So, what those values can be? Yes, it is 2 and 3.

Hence after filling the slots it becomes (x + 2)(x + 3) = 0
Solve for x. As the rule says; if a product of two or more factors is equal to zero, then at least one of the factor is equal to zero. Hence, either:

(x + 2) = 0 or (x + 3) = 0
or

X = −2 or x = −3

Q 3.

Correct Answer is A

Start with the initial equation.

$$x^2 - 3x + 3 = 0$$

Add 3 to both sides to set the equation equal to zero.

$$(x + ?)(x + ?) = 0$$

Break the equation into two "roots" or "factors."

$$(x - 3)(x - 1) = 0$$

Find the two numbers which add up to the second number (the -3) and multiply to the third number (the 3). These will be the numbers in the parentheses that multiply to x in the original equation.

$$x = 3, 1$$

Q 4.

Correct Answer is C

$x^2 + 5 = -6x$ Take the initial equation.

$x^2 + 6x + 5 = 0$ Add 6x to both sides to set the equation equal to zero. Make sure that the equation is in the form $x^2 + bx + c = 0$.

(x + ?)(x + ?) Break the equation into factors. What two numbers add up to the middle number (6) and multiply to the last number (5)?

(x + 5)(x + 1) = 0 Plug the correct numbers into the equation.

x = -5, -1 x is the opposite of these numbers.

Q 5.

Correct Answer is D

$x^2 - 2x = 8$ Take the initial equation.

x -2x - 8 = 0 Subtract 8 from both sides to set the equation equal to zero. Make sure that the equation is in the form $x^2 + bx + c = 0$.

(x + ?)(x + ?) Break the equation into factors. What two numbers add up to the middle number (-2) and multiply to the last number (-8)?

(x - 4)(x + 2) = 0 Plug the correct numbers into the equation.

x = 4, -2 x is the opposite of these numbers.

Section Drill

1. Simplify b - [b - (a + b) - (b - (b – a + b)) + 2a]

   A. A. B. 2a
   C. 4A. D. 8a

2. If x - y = 1, then $x^3 - y^3 - 3xy$ equals

   A. 0 B. 1
   C. 2 D. x2 - y2

3. If $x^2 + 4x + 2 = -1$, then what does *x* equal?

   A. -3, -1 B. -3, 5
   C. 3, -5 D. 3, 5

4. If a and b are prime numbers, which of the following is true?

   I. a^2 has three positive integer factors.
   II. ab has four positive integer factors.
   III. a^3 has four positive integer factors.

   A. I and II only B. II and III only
   C. All of these D. None of these

5. If x = b + c, y = c a, z = a b, then $x^2 + y^2 + z^2 - 2xy - 2xz + 2yz$ is equal to

   A. a + b + C. B. $4b^2$
   C. abC. D. $a^2 + b^2$

6. (3080 + 6160) / 28

   A. 380 B. 350
   C. 330 D. 300

7. Value of $2^5 \times 9^2$ has been written as 2596, what is the difference between actual values.

   A. 1 B. 2
   C. 3 D. 4

8. Sum of three prime numbers is 100. If one of them exceeds another by 36, then one of the numbers is

   A. 7 B. 29
   C. 41 D. 67

9. If $x^3 + y^3 + z^3 = 0$, then $x^2/yz + y2/zx + z^2/xy$ equal

   A. 0 B. 1
   C. 2 D. 3

10. Which of the following equations has a solution in common with $x^2-2x-15=0$?

    A. x2- 6x+9 = 0
    B. x2 + 2x - 15 = 0
    C. 2x2 + 9x + 9 = 0
    D. 2 x2 + x - 3 = 0
    E. none of the above

11. If $\frac{5+x}{x-3}$ then which of the following is a possible value of *x*?

    A. -2 B. 5
    C. 7 D. -3
    E. 1

12. In three years, Javed will be three times as old as her daughter will. Six years ago, his age was her daughter's age squared. How old is Javed?

    A. 18 B. 36
    C. 40 D. 42
    E. 45

13. If apples cost *x* dollars per *m* dozen, how many dollars will it cost to buy *n* apples?

    A. $\frac{xn}{12m}$ B. $\frac{xn}{m}$
    C. $\frac{m}{xn}$ D. $\frac{12m}{xn}$
    E. $\frac{12mn}{x}$

14. Which of the following is a solution to the equation $x^2 - 4x - 32 = 0$?

    A. -12 B. -8
    C. -4 D. 4
    E. 12

15. If p - q = 3 and $p^2 + q^2 = 29$, find the value of pq

    A. 7 B. 8
    C. 9 D. 10
    E. 11

16. Two boards are being cut for a construction project. If the total length of the boards is 100 inches and the shorter board is 5 inches less than half the length

of the longer board, what is the length of the shorter board?

A. 25 inches
B. 30 inches
C. 35 inches
D. 65 inches
E. 70 inches

17. If the average (arithmetic mean) of a list of s integers is 18, what is the sum of the integers?

A. 9s
B. $\frac{18}{s}$
C. 18s
D. $\frac{9}{s}$
E. 18 + s

18. What are the roots of the equation $x^2 - 12x = -27$?

A. (18, 9)
B. (18, – 9)
C. (– 3, – 9)
D. (– 3, 9)
E. (3, 9)

19. How many pieces of 0.85 meters can be cut from a rod 42.5 meters' long

A. 30
B. 40
C. 50
D. 60
E. 70

20. Evaluate: 30 - 12÷3×2 =

A. 12
B. 22
C. 24
D. 32

SOLUTIONS:

Q 1.

Correct Answer is D

b-[b - (a + b) - (b - (b – a + b)} + 2a]
=b - [b – a – b - (b - (2b - a)) + 2a]
=b - [-a - (b - 2b + a) + 2a]
=b - [-a - (- b + a) + 2a]
=b-[-a + b – a + 2a]
=b-[-2a + b + 2a]
=b - b
=0

Q 2.

Correct Answer is B

$x^3 - y^3 - 3xy = x^3 - y^3 - 3xy(x - y)$

as $(x - y) = 1$
$= (x - y)^3 = 1$

Q 3.

Correct Answer is A

$x^2 + 4x + 2 = -1$ Take the initial equation.

$x^2 + 4x + 3 = 0$ Add 1 to both sides to set the equation equal to zero. Make sure that the equation is in the form $x^2 + bx + c = 0$.

(x + ?)(x + ?) Break the equation into factors. What two numbers add up to the middle number (4) and multiply to the last number (3)?

(x + 3)(x + 1) = 0 Plug the correct numbers into the equation.

x = -3, -1 x is the opposite of these numbers.

Q 4.

Correct Answer is C

Factors of a' are 1. a and a'.
Factors of ab are 1, a, b and ab.
Factors of a' are 1. a. a' and a'

Q 5.

Correct Answer is B
$x' + y' + z' - 2xy - 2xz + 2yz$
$= (x - y - z)'$
$= (b + c - c + a - a + b)' = 4b'$

Q 6.

Correct Answer is C
As per BODMAS rule, first we will solve the equation in bracket then we will go for division
= (9240)/28 = 330

Q 7.

Correct Answer is D
$2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32$ and $9^2 = 81$
Hence; $2^5 \times 9^2 = 2592$
The difference between 2596 and 2592 is 4.

Q 8.

Correct Answer is D.

$x + (x + 36) + y = 100$

$\Rightarrow 2x + y = 64$

Therefore y must be even prime which is 2

$2x + 2 = 64$

$\Rightarrow x = 31.$

$\therefore$ Third prime number $= x + 36 = 31 + 36 = 67$

Q 9.

Correct Answer is

Option: A

Solve the equation $x^2/yz + y2/zx + z^2/xy$

By taking the LCM we get

$\frac{x^3 + y^3 + z^3}{xyz} = 0/xyz = 0$

Q 10.

Correct Answer is C.

The equation in the question factors out to $(x - 5)(x + 3) = 0$; $x = 5$ or -3. The equations in the answer choices factor out to

A. $x^2 - 6x + 9 = 0 = (x - 3)(x - 3)$; the solution is $x = 3$

B. $x^2 + 2x - 15 = 0 = (x + 5)(x - 3)$; the solution is $x = 3, -5$

C. $2x^2 + 9x + 9 = 0 = (2x + 3)(x + 3)$; the solution is $x = -3, -3/2$

D. $2x^2 + x - 3 = 0 = (2x + 3)(x - 1)$; the solution is $x = -3/2, 1$

Of these choices, only C shares a solution, -3, with the equation in the question.

Q 11.

Correct Answer is B.

You could either solve this problem algebraically or just plug in the values for the answer choices until one works. To solve algebraically, you restate the equation as $5 + x = x2 - 3x$; $0 = x^2 - 4x - 5 = (x - 5)(x + 1)$; the solutions to the equation are $x = 5$ or -1; of these choices, 5 is the only available answer choice.

Q 12.

Correct Answer is D. For this problem, you need to set up two equations representing the statements in the question; then you can either solve algebraically or plug in the answer choices and find the one that works.

The equations we need, if J = Javed's current age and D = daughter's current age, are

$J + 3 = 3(D + 3)$ and $J - 6 = (D - 6)^2$

which can be restated as $J + 3 = 3D + 9$ and $J - 6 = D^2 - 12D + 36$

Note that when talking about times in the past or future, we need to make the same adjustments

to both Janice's and her daughter's age. If we use the subtraction method, we can subtract the first equation from the second to remove the J variable:

$J - 6 = D^2 - 12D + 36$

$-J - 3 = -3D - 9$

$-9 = D^2 - 15D + 27$

which we can restate as

$0 = D^2 - 15D + 36 = (D - 12)(D - 3)$

Therefore, the daughter's age must be either 12 or 3. The age 3 makes no sense given the condition in the statement referring to 6 years ago, so the daughter's age must be 12. We can then plug this into one of the original equations to get Javed's age:

$J + 3 = 3(12 + 3) \rightarrow J + 3 = 45 \rightarrow J = 45 - 3 = 42$

Q 13.

Correct Answer is A. If we set up this problem as a proportion with dollars on top and apples on bottom, you get (let's call the amount of money we're trying to solve for y). Cross-multiplying gives us

$12my = xn$, and to get y alone, we would just divide by 12m on both sides, giving us.

Q 14.

Correct Answer is C.

The equation $x^2 - 4x - 32 = 0$ expands out into $(x - 8)(x + 4) = 0$, so the solutions are 8 and -4.

Watch out for trap answers such as -8 and 4.

Q 15.

Correct Answer is D.

We know

$2ab = (a^2 + b^2) - (a - b)^2$

Therefore; $2pq = 29 - 9 = 20$

So, $pq=10$

Q 16.

Correct Answer is B.

Again, this is a great problem to just try the answer choices. If the shorter board is "5 inches less than half" the longer board, we could just use the answer choices as the length of the shorter board, add five, and multiply by two. A doesn't work—if the shorter board is 25, the longer board would be 60, and those don't add up to 100. B works—a shorter board of 30 gives us a longer board of 70 (remember, add 5 then multiply by 2), and those add up to 100.

Q 17.

Correct Answer is C. To find a mean, you add up a list of numbers and then divide by the number of numbers. So, if you have the average already (18), you just need to multiply by the number of numbers (s) to get your answer: 18s.

Q 18.

Correct Answer is E. First we have to manipulate the equation to get it into a standard form. By adding 27 to both sides, we get $x^2 - 12x + 27 = 0$ ... something we're a little more used to seeing. Factoring this quadratic gives us $(x - 3)(x - 9) = 0$, so our roots are 3 and 9.

Q 19.

Correct Answer is C.

We need so simple divide 42.5/0.85,
= (4250/85) = 50

Q

Correct Answer is B

According to order of operations, $12 \div 3 \times 2$ (division and multiplication) is done first from left to right

$12 \div 3 \times 2 = 4 \times 2 = 8$
Hence
$30 - 12 \div 3 \times 2 = 30 - 8 = 22$

VERBAL REASONING

ANALOGIES

In HAT Analogies, you will be given a pair of words and will be asked to choose from five other pairs of words to find the relationship that most closely resembled that of the first pair.

Analogies provide excellent training in seeing relationships between concepts. From a practical standpoint, verbal analogies always appear on the HAT test.

How to Read Analogies

The symbol (:) means "is to" and the symbol (: :) means "as." Thus, the analogy, "aspirin: headache: : nap : fatigue," should be read "aspirin is to headache as nap is to fatigue." Stated another way, the relationship between aspirin and headache is the same as the relationship between nap and fatigue.

Tips for Doing Analogies

- *Try to determine the relationship between the first pair of words.*
- Eliminate any pairs in your answer choices that don't have the same relationship.
- *Try putting the first pair into a sentence: "Aspirin relieves a headache." Therefore, a nap relieves fatigue.*
- *Sometimes paying attention to the words' parts of speech helps. For example "knife" (noun): "cut" (verb): : "pen" (also a noun) : "write" (also a verb).*

COMMON RELATIONSHIPS BETWEEN WORD PAIRS

1. **Sameness (synonyms)**	boring : monotonous wealthy : affluent : : indigent : poverty-stricken
2. **Oppositeness (antonyms)**	genuine : phony zenith : nadir : : pinnacle : valley
3. **Classification Order (general - specific)**	food : fruit : peach orange : fruit : : beet : vegetable
4. **Difference of Degree (or Connotative Values)**	cool : cold : frozen slender : skinny clever : crafty : : modest : prim
5. **Person Related to Tool, Major Trait, Skill, or Interest**	writer : novel entomologist : insects : : philosopher : ideas
6. **Part and Whole**	wheels : bicycle eraser : pencil : : tooth : comb
7. **Steps in a Process**	birth : life : death cooking : serving : : word processing : printing
8. **Cause and Effect (or Typical Result)**	poison : death fire : scorch : : blizzard : freeze
9. **Thing and Its Function**	shovel : dig scissors : cut : : pen : write
10. **Qualities or Characteristics**	gold : valuable aluminum lightweight : : thread : fragile
11. **Substance Related to End Product**	cow : milk silk : scarf : : wool : sweater
12. **Implied Relationships**	light : knowledge clouds : sun : : hypocrisy : truth

13. Thing and What It Lacks	spinster : husband atheist : belief : : indigent : money
14. Symbol and What It Represents	Uncle Sam : U. S. dove : peace : : four-leaf clover : luck

Topic Drill

1. Spine : Vertebrae
   A. hair : strands
   B. finger : fingernails
   C. liver : kidneys
   D. skeleton : bones
   E. table : metal

2. Screw : Bolt
   A. twist : cable
   B. pound : nail
   C. break : ice
   D. tear : vest
   E. clamps : drill

3. Fuchsia : Pink
   A. turquoise : yellow
   B. crimson : red
   C. blue : navy
   D. gray : tan
   E. white : black

4. Weaving : Loom
   A. crochet : loop
   B. bobbin : thread
   C. pottery : kiln
   D. embroidery : pattern
   E. string : knot

5. Fishing : Rod
   A. trapping : fur
   B. reel : worm
   C. portaging : forest
   D. skinning : blade
   E. hunting : rifle

6. Defendant : Tried
   A. jurist : judgeD.
   B. accountant : enumerated
   C. actuary : tabulateD.
   D. judge : examined
   E. prisoner : incarcerated

7. Egg : Shell
   A. orange : section
   B. tomato : skin
   C. rind : watermelon
   D. lemon : pit
   E. ginger : bread

8. Window : Ledge
   A. garage : car
   B. truck : stop
   C. counter : kitchen
   D. door : lintel
   E. cupboard : drawer

9. Accelerate : Pedal
   A. store : hooD.
   B. cover : hubcap
   C. steer : wheel
   D. decelerate : gear
   E. switch : transmission

10. Atom : Microscope
    A. tape : microphone
    B. planet : telescope
    C. person : microcosm
    D. receiver : telephone
    E. submarine : periscope

11. Choir : Vocalist
    A. lyricist : melody
    B. car : mechanic
    C. bassoon : oboe
    D. orchestra : instrumentalists
    E. percussion : woodwind

12. Pact : Covenant
    A. summons : deadline
    B. subpoena : brief
    C. warrant : letter
    D. tract : treatise
    E. temperance : beverage

13. Yard : Mile
    A. ounce :ton
    B. frequency : time

C. cent : dollar
D. quart : pint
E. minute : acre

14. Moose : Antlers
A. caribou : hooves
B. grizzly : bears
C. ram : horns
D. sheep : ewes
E. kid : goat

15. Chronic : Acute
A. symphony : ditty
B. constant : sudden
C. ailing : mortal
D. timely : belated
E. difficult : facile

16. Gothic : Renaissance
A. medieval : papist
B. summer : winter
C. baroque : architecture
D. ornate : royal
E. modern : contemporary

17. Baseball : Run
A. tennis : lobby
B. net : basketball
C. bat : glove
D. football : volleyball
E. hockey : goal

18. Ebullience : Exuberance
A. indigence : wealth
B. insolence : impudence
C. forbearance : patience
D. impermanence : indolence
E. liveliness : fatuousness

19. Fecund : Barren
A. dogmatic : arbitrary
B. disheveled : untidy
C. forthcoming : definite
D. dolorous : felicitous
E. lonely : isolated

20. Subterranean : Subway
A. rickshaw : pedal
B. train : track
C. highway : vehicle
D. airplane : runway
E. aerial : helicopter

21. Grain : Rice
A. cube : ice
B. flurry : precipitation
C. flake : snow
D. potato : loaf
E. milk : liter

22. Pistol : Bullet
A. rifle : trigger
B. target : range
C. gunpowder : explosion
D. crossbow : arrow
E. dagger : point

23. Terminate : Employment
A. prescribe medicine
B. renew : baby
C. specialize : doctor
D. demolish : truck
E. finalize : lawyer

24. Mosaic : Tiles
A. painting : canvas
B. fresco : paintbrush
C. blend : beans
D. narrative : prologue
E. puzzle : pieces

25. Rescind : Repeal
A. repast : forewarn
B. reticent : talkative
C. restore : reinstate
D. recreant : compensate
E. relive : renaissance

26. Subpoena : Court
A. innocence : pleA.
B. trial : witness
C. invitation : party
D. reservoir : water
E. memorandum : office

27. Fish : School
A. octopus : tentacle
B. carp : car
C. lion : pride

D. student : university
E. pack : wolf

28. Jazz : Music
A. opera : virtuoso
B. impressionism : painting
C. saxophone : flute
D. rhythm : tone
E. marble : sculpture

29. Adorn : Beautiful
A. invigorate : lively
B. forgive : correct
C. attract : favorable
D. exert : dynamic
E. paint : color

30. Dearth : Glut
A. flood : deluge
B. lack : surplus
C. parcel : postage
D. width: girth
E. rise : acceleration

SOLUTIONS

Q 1.
The correct answer choice is D. The spine is made of vertebrae. The skeleton is made of bones.

Q 2.
The correct answer choice is B. A bolt is something that one screws. A nail is something that one pounds.

Q 3.
The correct answer choice is B. Fuchsia is a shade of pink. Crimson is a shade of red. Q 4. Correct Answer is

Q 4.
The correct answer choice is . A loom is a piece of equipment used in weaving. A kiln is a piece of equipment used in pottery.

Q 5.
The correct answer choice is E. A rod is a piece of equipment used in fishing. A rifle is a piece of equipment used in hunting.

Q 6.
The correct answer choice is E. A defendant is a person who is tried. A prisoner is a person who is incarcerated.

Q 7.
The correct answer choice is B. An egg is surrounded by a shell. A tomato is surrounded by a skin.

Q 8.
The correct answer choice is D. A window has a ledge. A door has a lintel.

Q 9.
The correct answer choice is C. To accelerate in a car one uses a pedal. To steer in a car one uses a wheel

Q 10.
The correct answer choice is B. One needs a microscope to see an atom. One needs a telescope to see a planet

Q 11.
The correct answer choice is D. A choir is made up of vocalists. An orchestra is made up of instrumentalists.

Q 12.
The correct answer choice is D. Pact is a synonym of covenant. Tract is a synonym of treatise.

Q 13.
The correct answer choice is A. Yard is a relatively short measure of length, while mile is a relatively long measure of length. Ounce is a relatively small measure of weight, while ton is a relatively large measure of weight.

Q 14.

The correct answer choice is C. Moose have antlers on their heads. Rams have horns on their heads.

Q 15.

The correct answer choice is B. Something chronic continues over a long period. Something acute is short-lived. Something constant continues over a long period. Something sudden is short-lived.

Q 16.

The correct answer choice is B. Gothic and renaissance are both eras. Summer and winter are both seasons

Q 17.

The correct answer choice is E. One scores in baseball by getting a run. One scores in hockey by getting a goal.

Q 18.

The correct answer choice is C. Someone who exhibits ebullience is showing exuberance. Someone who exhibits forbearance is showing patience.

Q 19.

The correct answer choice is D. Someone who is fecund is not barren. Someone who is dolorous is not felicitous.

Q 20.

The correct answer choice is E. The subway is a subterranean form of transportation. The helicopter is an aerial form of transportation.

Q 21.

The correct answer choice is E. A single unit of rice is a grain. A single unit of snow is a flake.

Q 22.

The correct answer choice is D. A pistol fires a bullet. A crossbow fires an arrow

Q 23.

The correct answer choice is A. One terminates employment. One prescribes medicine.

Q 24.

The correct answer choice is E. A mosaic is made up of many tiles. A puzzle is made up of many pieces.

Q 25.

The correct answer choice is C. To rescind means to repeal. To restore means to reinstate.

Q 26.

The correct answer choice is C. A subpoena is a summons to a court. An invitation is a summons to a party.

Q 27.

The correct answer choice is C. A group of fish is called a school of fish. A group of lions is called a pride.

Q 28.

The correct answer choice is B. Jazz is a style of music. Impressionism is a style of painting.

Q 29.

The correct answer choice is A. To adorn is to make beautiful. To invigorate is to make something lively.

Q 30.

The correct answer choice is B. The word dearth is an antonym of the word glut. The word lack is the antonym of the word surplus.

VOCABULARY

Following is a list of English words with meaning. You are advised to memorize all these words. All these words will be used in the Verbal section in the next module.

Word	Common Meaning
Accompanied	Go somewhere with (someone) as a companion or escort.
Aerodrome	A small airport or airfield.
Ample	Enough or more than enough; plentiful.
Cautious	(of a person) careful to avoid potential problems or dangers.
Clumsy	Awkward in movement or in handling things.
Concede	Admit or agree that something is true after first denying or resisting it.
Confine	Keep or restrict someone or something within certain limits of (space, scope, or time).
Credulous	Having or showing too great a readiness to believe things.
Ecstasy	An overwhelming feeling of great happiness or joyful excitement.
Enigmatic	Difficult to interpret or understand; mysterious.
Envision	Imagine as a future possibility; visualize.
Equanimity	Calmness and composure, especially in a difficult situation.
Evenly	So as to present a flat or uniform surface or line.
Exhibiting	Publicly display (a work of art or item of interest) in an art gallery or museum or at a trade fair.
Extravagantly	With a lack of restraint in spending money or using resources.
Fatigue	Extreme tiredness resulting from mental or physical exertion or illness.
Flaunt	Display (something) ostentatiously, especially in order to provoke envy or admiration or to show defiance.
Garnish	Decorate or embellish (something, especially food).
Gaucherie	Awkward or unsophisticated ways.
Genuine	Truly what something is said to be; authentic.
Gullible	Easily persuaded to believe something; credulous.
Imaginative	Having or showing creativity or inventiveness.
Initially	At first.

Loathe	Feel intense dislike or disgust for.
Magnificent	Extremely beautiful, elaborate, or impressive.
Misogynist	A person who dislikes, despises, or is strongly prejudiced against women.
Ostentatiously	In a pretentious or showy way designed to impress.
Palatial	Resembling a palace in being spacious and splendid.
Persist	Continue in an opinion or course of action in spite of difficulty or opposition.
Pivotal	Of crucial importance in relation to the development or success of something else.
Pungent	Having a sharply strong taste or smell.
Reverential	Of the nature of, due to, or characterized by reverence.
Solemn	Formal and dignified.
Strive	Make great efforts to achieve or obtain something.
Stygian	dark or gloomy
Submerged	Cause (something) to be under water.
Supernatural	(of a manifestation or event) attributed to some force beyond scientific understanding or the laws of nature.
Sympathetic	Feeling, showing, or expressing sympathy.
Tedious	Too long, slow, or dull; tiresome or monotonous.
Trite	(of a remark or idea) lacking originality or freshness; dull on account of overuse.
Turpitude	Depraved or wicked behavior or character.
Utterance	A spoken word, statement, or vocal sound.
Vitiate	Spoil or impair the quality or efficiency of.
Yields	Produce or provide (a natural, agricultural, or industrial product).

MODULE || 03

Analytical Reasoning

- Complex Linear Ordering with solved examples and Practice Drill

Quantitative Reasoning

- Averages
- Ratios and Proportions
- Inheritance
- Solved Practice Drill

Verbal Reasoning

- Antonyms – Techniques and Practice questions, Solved Practice Drill.

Vocabulary

- Vocabulary to memorize (This vocabulary will be used in solving verbal questions in the next module)

ANALYTICAL REASONING

DEALING CIRCULAR ORDERING

We have thoroughly studied the ordering of elements in a straight line - the most common type of HAT Questions. In the next most common type of ordering Question the elements are placed around a circle - typically, people who are evenly spaced around a table. Circular diagrams have a few interesting properties not found in linear diagrams.

First, circular diagrams - unlike linear diagrams—are not fixed. That is, circular diagrams do not have a first, second, . . ., or last position. You can envision a circle as derived from a line by bending the line until the left end point (say, the first) and the right end point (say, the last) meet - forcing the first and last elements to become one and the same. Hence, there is no beginning or end on a circle.

For this reason, you can initially place an element anywhere on the diagram - it can be fixed only in relation to other elements. It is conventional to place the first element at the top of the circle. Then place any additional elements (where applicable) to the left of it, clockwise around the circle.

Next, although there is no first, second, etc., on a circle, there is left-right orientation (at least locally).

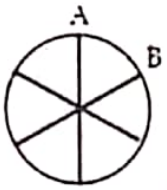
Therefore, if a condition states that one element is next to another element but does not state whether it is to the left or the right, then two diagrams that are mirror images of each other will be possible.

However, if there is no mention of the circle's orientation (left or right), then the mirror image of the diagram need not be considered.

For example, if it is given that A is next to B, and it is not specified whether A is to the left or right of

B, then only one of the following two possible diagrams need be considered. They will

I



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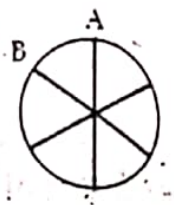


generate the same answer to any question.

When you draw your circle, insert spokes. Invariably, circular questions involve an even number of people (usually 6 or 8) spaced evenly around a circle. Therefore, a particular element will always be directly opposite another element. Drawing spokes inside the circle clarifies and highlights whether two elements are directly opposite each other, which often is a relevant issue.

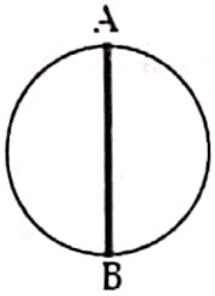
Now that we have our circle drawn with spokes inserted, we come to **the decision**: which element(s) do we place on the diagram first?

Always place elements whose positions are fixed relative to one another first.

Recall that with linear ordering questions we first place any element whose position is fixed (first, second, last, etc.). Then we place any elements whose positions are fixed relative to one another (e.g., B comes after C). Circular diagrams, however, are not fixed. Hence the first step does not apply, and we start with the second step.

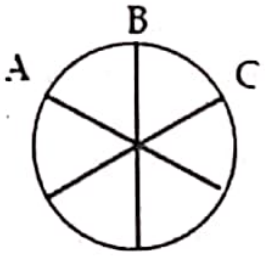
The relative position of elements around a circle can be fixed in either of two major ways. First, two elements can be directly opposite each other. This forms a **base axis**, which separates all the remaining elements to either

side of it. **Place the base axis on your diagram**



first. For example, if A is directly opposite B, then A and B form a base axis as follows:

Second, the elements can be immediately next



to each other. This forms a **base group**. For example, if B is immediately between A and C, then we have the following base group:

Place the base group on your circle after you have placed the base axis. Place it first if there is no base axis.

Circular Questions

Six people - Alyas, Babar, Chohan, Dabeer, Eman, Farhan - are seated evenly spaced around a circular table according to the following conditions:

Alyas does not sit next to Chohan.

Babar sits next to Chohan or Dabeer.

Farhan sits next to Dabeer.

If Eman sits next to Farhan, then she does not sit next to Chohan.

1. Of the following, which one is a possible seating arrangement of the six people?
   A. Alyas, Farhan, Dabeer, Chohan, Eman, Babar
   B. Alyas, Babar, Chohan, Farhan, Dabeer, Eman
   C. Alyas, Babar, Chohan, Eman, Farhan, Dabeer
   D. Alyas, Eman, Farhan, Dabeer, Babar, Chohan
   E. Alyas, Dabeer, Babar, Eman, Chohan, Farhan
2. If Babar is seated next to Farhan, then in which one of the following pairs must the people be seated next to each other?
   A. Alyas and Eman
   B. Babar and Dabeer
   C. Babar and Eman
   D. Chohan and Dabeer
   E. Chohan and Farhan
3. If Dabeer and Chohan sit next to each other, then Alyas could sit immediately between
   A. Babar and Chohan
   B. Babar and Farhan
   C. Dabeer and Eman
   D. Dabeer and Farhan
   E. Farhan and Eman

SOLUTIONS

Hint for Explanation

As usual we construct a diagram to aid in answering the questions. First, translate the given conditions into symbols - abbreviating each name with its first letter.

The most concrete condition is *"Farhan sits next to Dabeer"*; it is naturally symbolized as **FD.**

Next, we symbolize the second most concrete condition, *"Babar sits next to Chohan or Dabeer,"* as

BC or BD. The "or" in this symbol is inclusive. That is, it includes the case in which B sits next to both C and D - in other words, immediately between them. (Unless otherwise stated the meaning of "or" is inclusive on the HAT).

Next, *"Alyas does not sit next to Chohan"* is symbolized as **~(AC)**.

Finally, we come to the last and most complicated condition, *"If Eman sits next to Farhan, then she*

does not sit next to Chohan." An initial symbol for this sentence might be **(EF)—>~(EC)**, where the arrow stands for "if.. . then...." However, we can derive a more descriptive symbol as follows: If Eman were to sit next to both Farhan and Chohan, and then she would be seated immediately between them. This is not allowed.

Thus the more concise symbol **~(FEC)** is equivalent to our original symbol **(EF)—>~(EC)**.

We now have the following schematic for our conditions:

ABCDEF

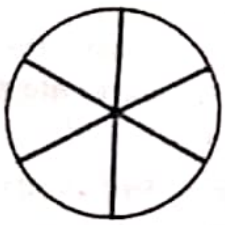
FD

BC or BD

~(AC)

~(FEC)

We need, however, a diagram to fill out our



- scheme ;o this end, draw the following circle with

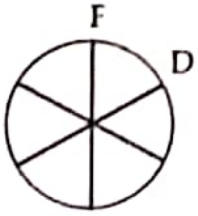
spokes inside:

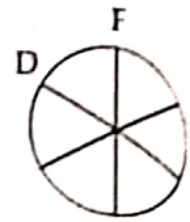
Next, following the strategies developed earlier, we scan the initial conditions for a base axis. There

is none. So we look for a base group. The only condition that fixes the relative position of two of the elements is **FD**; it forms our base group.

Since circle diagrams are not fixed, we may initially place **FD** anywhere on the circle. Following

convention, however, we put F at the top of the





circle, creating the following two possible diagrams:

In this problem, there is no mention of the circle's orientation (left or right). We, therefore, need to

consider only the first diagram, the other being the mirror image of it.

No other conditions fix the relative positions of the other elements, so our schematic is complete with diagram as follows:

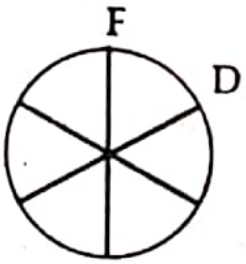
ABCDEF

FD

BC or BD

~(AC)

~(FEC)



This schematic is self-contained. There is no need to refer to the original problem, which should be

avoided whenever possible. Now we'll use this schematic to answer the questions.

Q1.

Of the following, which one is a possible seating arrangement of the six people?

(A) Alyas, Farhan, Dabeer, Chohan, Eman, Babar

(B) Alyas, Babar, Chohan, Farhan, Dabeer, Eman

(C) Alyas, Babar, Chohan, Eman, Farhan, Dabeer

(D) Alyas, Eman, Farhan, Dabeer, Babar, Chohan

(E) Alyas, Dabeer, Babar, Eman, Chohan, Farhan

This is a straightforward elimination question. We merely take the initial conditions in succession and test them against each answer-choice, eliminating any answer-choices that do not satisfy the conditions. The last remaining answer-choice will be the answer.

Let's start the elimination process with the condition **FD**. All the answer-choices have F next to D

except choice (E). This eliminates (E). Next, we use the condition **BC or BD**. Choices (B), (C), and (D)

all satisfy this condition; (A) does not. This eliminates (A). Next, using the condition **~(AC)**, we eliminate choice (D), which has A next to C. Note: Since this is a circular ordering, the list A, E, F, D, B, C does not end at C (recall that there is no first or last on a circle). Instead, the sequence returns to A and repeats the cycle. This is shown more clearly by the following "flow chart":

A → E → F → D → B → C

Finally, choice (C) contradicts the condition **~(FEC)**. This eliminates (C). Hence, by process of elimination, the answer is (B)—the only answer-choice remaining.

Q 2.

If Babar is seated next to Farhan, then in which one of the following pairs must the people be seated next to each other?

(A) Alyas and Eman

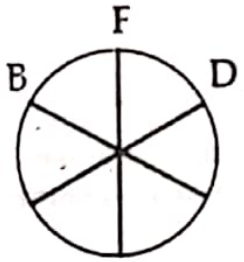
(B) Babar and Dabeer

(C) Babar and Eman

(D) Chohan and Dabeer

(E) Chohan and Farhan

The new condition, *"Babar is seated next to Farhan,"* is naturally symbolized as **BF**. Adding



this condition to our original diagram gives

Next, from the condition **BC or BD**, we see that B must be next to C, as it is not next to D in the

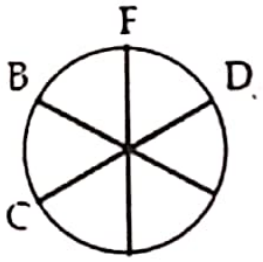
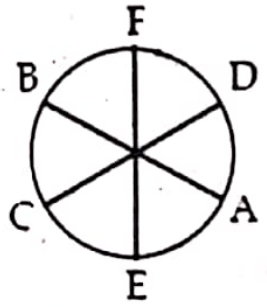


diagram. Our diagram, therefore, is as follows:

Finally, the condition **~(AC)** forces A next to D (otherwise it would be next to C), which in turn



forces E

between A and C. Thus our uniquely determined diagram is

From this diagram, we see that A must sit next to E and therefore the answer is (A).

Q 3.

If Dabeer and Chohan sit next to each other, then Alyas could sit immediately between

(A) Babar and Chohan

(B) Babar and Farhan

(C) Dabeer and Eman

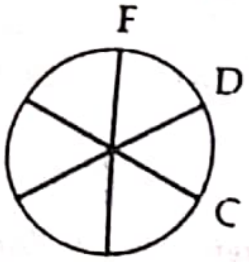
(D) Dabeer and Farhan

(E) Farhan and Eman

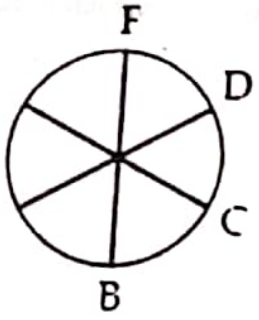
Remember that the questions in a Question problem are independent of one another. So the condition

BF, in Question 2, does not apply to this question.

Begin by adding the new condition *"Dabeer sits next to Chohan"*—**DC**—to the original diagram:

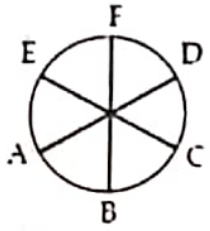


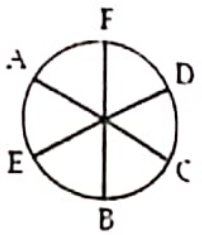
As in Question 2, the second condition, **BC or BD**, forces B next to C, and our diagram becomes



This diagram also satisfies the remaining initial conditions—**~(AC)** and **~(FEC)**. [Why?] Therefore, the

placement of A and E is arbitrary, and the following two diagrams are possible:





The second diagram satisfies choice (E). The answer, therefore, is (E).

Topic Drill

Question 1 to 6 are based on following statement

Four newscasters named Arifa, Bina, Chaman, and Dani are scheduled to interview four athletes named Eisha, Fraz, Gulzar, and Habib. There are four time slots for interviews, each of which will be occupied by one newscaster and one athlete.

The people who are paired together in each time slot are determined by the following:

Dani does not interview Habib or Fraz.

Chaman interviews Eisha.

If Gulzar is not interviewed first, then he is interviewed last.

Habib is interviewed in the time slot immediately before Eisha's.

QUESTIONS

1. Which of the following could be the order in which the athletes are interviewed, from first to last?

   A. Habib, Eisha, Fraz, Gulzar.
   B. Eisha, Fraz, Habib, Gulzar.

C. Habib, Gulzar, Eisha, Fraz
D. Eisha, Habib, Fraz, Gulzar.
E. Gulzar, Fraz, Eisha, Habib.

2. If Fraz is interviewed fourth, then which of the following must be true?

A. Dani interviews fourth.
B. Bina interviews second.
C. Chaman interviews third.
D. Arifa interviews first.
E. Eisha is interviewed second.

3. If Arifa interviews third, then which of the following must NOT be true?

A. Chaman interviews second.
B. Fraz is interviewed fourth.
C. Chaman interviews fourth.
D. Bina interviews first.
E. Habib is interviewed first.

4. If Dani interviews in a time slot consecutive with the one in which Chaman interviews, then which of the following must be true?

A. Arifa interviews second.
B. Fraz is interviewed first.
C. Bina interviews second.
D. Gulzar is interviewed first.
E. Eisha is interviewed second.

5. How many people cannot interview or be interviewed last?

A. one
B. two
C. three
D. four
E. five

6. If Arifa and Bina interview in consecutive time slots, then which of the following must be true?

A. Dani interviews Gulzar in time slot 3.
B. Bina interviews Gulzar before Eisha is interviewed.
C. Chaman does not interview in a time slot consecutive with the one in which Habib is interviewed.
D. Gulzar is interviewed first, and Habib is interviewed second.
E. Habib does not interview in a time slot before the one in which Fraz is interviewed.

Question 7 to 12 are based on following statement

At an animal therapy session, a group of dogs named A, B, C, D, and E are each paired with one of the following cats: F, G, H, I, and J. During the session, one dog will be isolated with one cat for several hours in each of the therapy rooms—1 through 5. The purpose of the session is to breed harmony and engender camaraderie between the species.

The pairs and room assignments are governed by the following constraints:

Danial is in room 3.

Charli is paired with Gull.

Fraz is paired with Bakhtawar.

Aliya is in a lower-numbered therapy room than Danial and Gull.

Javead is in room 2.

7. Which of the following could NOT be two animals that are paired together?

A. Bakhtawar, Fraz.
B. Javead, Ehsan.
C. Inam-Ul-Haq, Danial.
D. Hajra, Charli.
E. Aliya, Inam-Ul-Haq.

8. Which of the following could be the list of the cats in the rooms from first to last?

A. Fraz, Javead, Inam-Ul-Haq, Hajra, Gull
B. Fraz, Inam-Ul-Haq, Javead, Gull, Hajra
C. Hajra, Gull, Inam-Ul-Haq, Javead, Fraz
D. Fraz, Javead, Gull, Hajra, Inam-Ul-Haq

E. Hajra, Javead, Fraz, Inam-Ul-Haq, Gull

9. How many different cats could Aliya potentially be paired with?

A. one
B. two
C. three
D. four
E. five

10. If Inam-Ul-Haq is in therapy room 4, then which of the following must be true?

A. Gull is in therapy room 3.
B. Hajra is in therapy room 2.
C. Fraz is in therapy room 1.
D. Charli is in therapy room 2.
E. Bakhtawar is in therapy room 5.

11. Which of the following could be true?

A. Charli is paired with Hajra.
B. Aliya is in a higher-numbered room than Danial.
C. Aliya is in a higher-numbered room than Javead.
D. Inam-Ul-Haq is paired with Danial.
E. Fraz is in therapy room 3.

12. Which of the following must NOT be true?

A. Charli is in a lower-numbered room than Inam-Ul-Haq.
B. Danial is in a higher-numbered room than Gull.
C. Bakhtawar is not in a room that is consecutively numbered with Ehsan's room.
D. Javead is in a room that is consecutively numbered with Inam-Ul-Haq's room.
E. Gull and Hajra are not in consecutively numbered rooms.

Question 13 to 18 are based on following statement

At a Ping-Pong exhibition, players from the Pakistan named Aneela, Baig, Charli, Danial, and Ehsan are matched up with players from Canada named Fraz, Gull khan, Huma, Iftikhar, and Jawad at tables numbered 1 through 5. All people will play, and no person will play someone from his or her own country.

The matchups and the tables at which the players will play are determined by the following constraints:

The number of Baig's table is two greater than the number of Danial's.

The number of Huma's table is two less than the number of Jawad's.

If Charli does not play on the table numbered one less than Aneela's table, then Gull khan plays on the table numbered one less than Iftikhar's table.

Baig does not play Huma or Jawad.

Danial does not play Huma or Jawad.

13. Which of the following could be the order in which the Canadian players play, from the lowest-numbered to the highest-numbered table?

A. Fraz, Jawad, Gull khan, Iftikhar, Huma.
B. Iftikhar, Gull khan, Huma, Fraz, Jawad.
C. Huma, Fraz, Jawad, Gull khan, Iftikhar.
D. Iftikhar, Huma, Gull khan, Fraz, Jawad.
E. None of the above.

14. If Charli plays on table 4, then which of the following must be true?

A. Ehsan plays on table 2.
B. Iftikhar plays on table 3.
C. Gull khan plays on table 5.
D. Aneela plays on table 3.
E. None of the above.

15 If Baig plays with Fraz, then which of the following could be true?

A. Iftikhar plays on table 4.
B. Gull khan plays on table 2.
C. Gull khan plays on table 4.
D. Baig plays with Jawad.
E. None of the above.

16. Which table could Gull khan NOT play on?

A. 1 B. 2
C. 3 D. 4
E. 5

17. Which of the following players could never be paired together?

A. Baig, Gull khan.
B. Iftikhar, Aneela.
C. Gull khan, Charli.
D. Danial, Jawad.
E. None of the above.

18. If Huma plays on table 2, then how many different configurations of the players in the tournament are possible?

A. six B. eight
C. ten D. twelve
E. fourteen

ANSWER AND EXPLANATIONS

Hint for Explanation Question 1 to 6

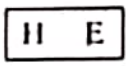
1.

1. Transcribe the Constraints

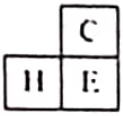
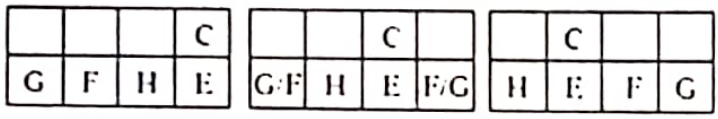
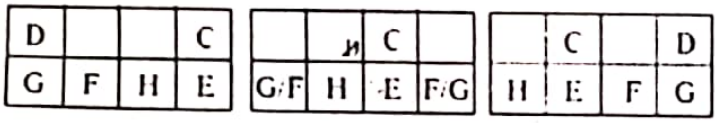
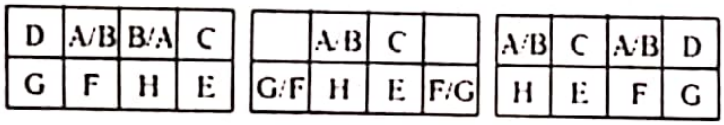
1. **Sufficient-Necessary:**
   $G_1 \rightarrow G_2$: $\not G_2 \rightarrow \not G_1$
2. **Box Rule:**

3. **Box Rule:**

4. **Box Rule:**

5. **Box Rule:** 

Notice that box rules 4 and 5 can be added to make the following more comprehensive box rule:

	
2.	**Draw the Complex Linear Scenarios.** *Is there a burdensome constraint?* Yes, the CEH box is very restrictive and can go in only three places, so you should draw out these scenarios: ***Draw in other evident constraints.*** The sufficient-necessary constraint tells you that G can go only first or last, so you should note this in your diagram. There are only four variables in the bottom, so if you learn the place of G in any of the diagrams, then you will also know the place of F. 
3.	**Write Out the Vacancy-Occupancy Rules.** *Draw in vacancy rules for each possible scenario.* You know that Dani cannot interview Fraz or Habib—or Eisha, since Chaman must interview him—so you can determine the place of Dani in a couple of scenarios, or at least find a vacancy rule:  *Draw in double possibilities and other occupancy rules.* Notice how the vacancy rule in the second scenario leads you to write in a double possibility here: 
4.	**Make Deductions from the Diagram.** There are no more deductions that can be made here, but it is always good as a habit to question whether there are. This sometimes will show you more deductions and always will force you to process the Question on a deeper level and therefore remember more of it when it is necessary.

Q 1.

Which of the following could be the order in which the athletes are interviewed, from first to last? (A) This order can happen in the third scenario.

Q 2.

If Fraz is interviewed fourth, then which of the following must be true?

(C) This constraint must occur in the second scenario, and it would cause Gulzar to be interviewed first. Chaman interviews third in this scenario.

Q 3.

If Arifa interviews third, then which of the following must NOT be true?

(B) This constraint can happen in either the first or the third scenario. Fraz cannot be interviewed fourth in either of these scenarios.

Q 4.

If Dani interviews in a time slot consecutive with the one in which Chaman interviews, then which of the following must be true?

(B) This constraint is possible only in the second scenario. Dani would interview fourth to be consecutive with Chaman, and since she cannot interview Fraz due to the no-box rule, Fraz must be interviewed first.

Q 5.

How many people cannot interview or be interviewed last?

(A) Fraz, Gulzar, and Eisha can be interviewed last. Arifa, Bina, Chaman, and Dani can interview last. This leaves Habib as the only person not able to go last.

Q 6.

If Arifa and Bina interview in consecutive time slots, then which of the following must be true?

(E) This constraint can happen in the first or the second scenario. It seems that Habib can be interviewed before Fraz in the second scenario, but if Arifa and Bina are consecutive, then they occupy the first two time slots, forcing Dani to slot 4. Fraz cannot be interviewed by Dani, so that forces him to slot 1. This slot precedes Habib's, which is slot 2.

Hint for Explanation question 7 to 12

1.	**Transcribe the Constraints**

1. **Direct Placement:** D = 3
2. **Direct Placement:** J = 2
3. **Box Rule:** C G
4. **Box Rule:** B F
5. **Sequencing Rule:** A < D
6. **Sequencing Rule:** A < G

2. **Draw the Complex Linear Scenarios.** *Is there a burdensome constraint?* There does not yet appear to be a burdensome constraint.

	1	2	3	4	5
A–E			D		
F–J		J			

3. **Write Out the Vacancy-Occupancy Rules.** *Draw in vacancy rules.* The sequential constraints impose some restraint on the CG box, because Aliya must be in a lower- numbered room than Gull. This means that Charli and Gull cannot go in the first room. Aliya must also go in a room with a lower number than Danial's, leaving Aliya the option of going in only the first or the second room.

		D		
	J			

Looking further into the diagram, you can see that the CG box can go only in the fourth or the fifth room. This would leave the BF box able to go in either the first or in one of the last two rooms that the CG box does not occupy. This makes a total of four scenarios that you can draw in:

		D	B	C
	J		F	G

		D	C	B
	J		G	F

B		D		C
F	J			G

B		D	C	
F	J		G	

Draw in double possibilities and other occupancy rules. In the bottom two scenarios, you can deduce where the variables must go in the top row. In all other places in the Question, you can write in double possibilities:

A/E	E/A	D	B	C
H/I	J	I/H	F	G

A/E	E/A	D	C	B
H/I	J	I/H	G	F

B	A	D	E	C
F	J	H/I	I/H	G

B	A	D	C	E
F	J	H/I	G	I/H

4. **Make Deductions from the Diagram.** There are no deductions left to make. As you improve at spotting different scenarios for the variables, there will be some occasions in the future when you will recognize that there are a limited number of scenarios but that you might not need to write them all out because you can remember them in your head. In the meantime, it is best to take things slowly and write them out as your brain exercises and accustoms itself to assimilating these techniques.

Q7.

Which of the following could NOT be two animals that are paired together?

(D) Charli must always be paired with Gull.

(A) Bakhtawar and Fraz must always be paired.

(B) Javead and Ehsan could be paired in either of the top two scenarios.

(C) Inam-Ul-Haq and Danial could be paired in all four scenarios.

(E) Aliya and Inam-Ul-Haq could be paired in either of the top two scenarios.

Q 8.

Which of the following could be the list of the cats in the rooms, from first to last?

(A) This order is possible in the bottom left scenario.

Q 9.

How many different cats could Aliya potentially be paired with?

(C) Aliya could be paired with Hajra, Inam-Ul-Haq, or Javead.

Q 10.

If Inam-Ul-Haq is in therapy room 4, then which of the following must be true?

(C) This constraint is possible only in the bottom left scenario, in which Fraz must be in the first room.

Q 11.

Which of the following could be true? **(D)** This answer choice could occur in any scenario.

(A) Charli is always paired with Gull.

(B) Aliya must always be in a lower-numbered room than Danial.

(C) Aliya must always be in the same room as or in a lower-numbered room than Javead.

(E) Fraz can never be in therapy room 3, because he has to be paired with Bakhtawar, and Danial is assigned to room 3.

Q 12.

Which of the following must NOT be true?

(B) Danial must never be in a higher-numbered room than Gull, because Gull can never go in therapy room 1 or 2.

Hint for Explanation question 13 to 18

1. **Transcribe the Constraints**

1. **Box Rule:** D / H
2. **Box Rule:** D / J
3. **Box Rule:** B / H
4. **Box Rule:** B / J
5. **Box Rule:** D ___ B
6. **Box Rule:** H ___ J
7. **Sufficient-Necessary:**

C/A → G/I · G/I → C/A

Ask yourself what this constraint means. It essentially says that either GI is a box or CA is a box—if one is not a box, then the other must be. Of course, both are concurrently possible

2. **Draw the Complex Linear Scenarios.** Is there a burdensome constraint? Yes; when you combine the activity of the DB box with that of the HJ box, then only a couple of scenarios arise for the Question. The DB box can go in three places, and its placement will dictate the position of the HJ box, since neither Danial nor Baig can play Huma or Jawad.

D		B		
	H		J	

		D		B
	H		J	

	D		B	
H		J		

	D		B	
		H		J

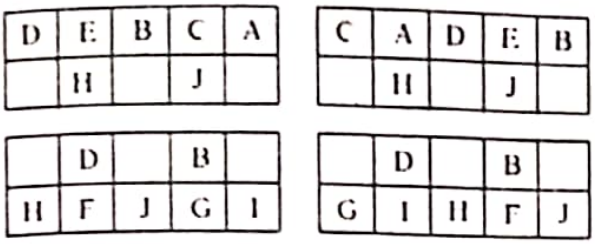
Draw in other evident constraints. You should now remember your sufficient-necessary constraints. They require that Charli play immediately before Aneela or Gull khan play immediately before Iftikhar.

D		B	C	A
	H		J	

C	A	D		B
	H		J	

	D		B	
H		J	G	I

	D		B	
G	I	H		J

	Since you know where four variables are in some rows, you automatically know where the fifth is: 
3.	**Write Out the Vacancy-Occupancy Rules.** In this instance, there are no more rules that can be drawn. Regardless, you should still consider this step, since often in Questions there are more variables to be drawn in or there are rules that you might have forgotten to include. Just to be safe, always include the consideration of this step.
4.	**Make Deductions from the Diagram.** The deductions are that the DB box can go in any of three places and that the HJ box's placement is entirely dependent on the DB box's position.

Q 13.

Which of the following could be the order in which the Canadian players play, from the lowest-numbered to the highest-numbered table?

(C) This order is possible in the bottom left scenario.

Q 14.

If Charli plays on table 4, then which of the following must be true?

(A) This constraint can happen only in the upper left scenario, in which Ehsan must play on table 2.

Q 15.

If Baig plays with Fraz, then which of the following could be true?

(E) None of these scenarios is possible.

Q 16.

Which table could Gull khan not play on?

(B) Gull khan cannot play on table 2 in any scenario.

Q 17.

Which of the following players could never be paired together?

(D) The initial constraints tell you that Danial and Jawad cannot face each other.

(A) Baig can be paired with Gull khan in the bottom left scenario.

(B) Iftikhar and Aneela could be paired in both of the left scenarios.

(C) Gull khan and Charli could be paired in both of the right scenarios.

(E) **D** is the correct answer.

Q 18.

If Huma plays on table 2, then how many different configurations of the players in the tournament are possible?

(D) This constraint is possible in the following two scenarios:

D	E	B	C	A
	H		J	

C	A	D	E	B
	H		J	

How many different places could F, G, and I go in either scenario? They could go:

1. FGI
2. FIG
3. GFI
4. GIF
5. IGF
6. IFG

There are six possibilities for each Question, making a total of twelve.

QUANTITATIVE REASONING

AVERAGE

The average value A of a set of n number of

$$A = \frac{\text{Sum of } n \text{ values } S_n}{n}$$

values is,

Alternatively, Sum of n number of values Sn = n × Average of n values

Using these two of the most basic concepts on average, the problems on average are solved.

Properties of average

- When the difference between all the items is same (and the number of terms is odd), then the average is equal to the middle term or it can also be stated the average of the first and last term would also be the average of all the terms of the sequence.
- If x is added to all the items, then the average increases by x.
- If x is subtracted from all the items, then the average decreases by x.
- If every item is multiplied by x, then the average also gets multiplied by x.
- If every item is divided by x, then the average also gets divided by x.

Example

Find the arithmetic mean of first five prime numbers.

Solution

First five prime numbers are 2, 3, 5, 7 and 11. The mean or the average formula is = Sum/no. = (2 + 3 + 5 + 7 +11)/5 = 5.6.

Example

Find the average of 56, 41, 59, 52, 42 and 44.

Solution

If the given items are very close to each other, a shortcut may be used instead of applying the average formula. Assume that the average is 50, as the terms are around 50 only. Now calculating the difference of all items with 50, you are getting + 6, - 9, +9, + 2, - 8, - 6. Now, if you add these numbers, the result comes out to be - 6. That implies this - 6 will be equally distributed among all the terms and every term will be reduced by - 6/6 = - 1 i.e. average will be reduced by 1. Thus the real average will be 50 - 1 = 49.

Example

The average salary of 20 officers in a company is 300. The average salary of non-officers in the same company is 120. Find the number of the non-officers if the average of the whole organization is 150.

Solution

There are two methods to solve this. One is the conventional method. Let the number of Non-officers be N. Now the equation can be made, knowing that the sum of the salaries of all the officers and non-officers would give the total salary of the organization. The equation will be $20 \times 300 + 120 \times N = 150 (20 + N)$. Solving this, N = 100.

Besides this, you can think logically that every officer is getting (300 - 150 = 150) Rs. 150 more than the average. Total of the extra money taken by all the officers together is $150 \times 20 = 3000$. Now every non-officer is getting (150 - 120) = Rs. 30 less than the average. How many officers will get Rs. 3000 less i.e. 3000/30 = 100. Hence there are 100 non-officers.

Topic Drill

1. A library has an average of 510 visitors on Sundays and 240 on other day. The average number of visitors in a month of 30 days starting with Sunday is

   A. 280 B. 285
   C. 290 D. 295

2. The average score of a cricketer for ten matches is 38.9 runs. If the average for first six matches is 42, then average for last four matches is

   A. 33.25 B. 32.25
   C. 34.25 D. 34.50

3. Find the average of first 10 multiples of 7

   A. 35.5 B. 37.5
   C. 38.5 D. 40.5

4. A motorist travel to a place 150 km away at an average speed of 50 km/hr and returns are 30 km/hr. His average speed for the whole journey in km/hr is

   A. 36.5 km/hr B. 37.5 km/hr
   C. 35.5 km/hr D. 34.5 km/hr

5. Average age of boys in a class is 16 years and average age of girls is 15 years, what is the average age of all

   A. 15.5
   B. 15
   C.16
   D. Can't be computeD.

6. Average of All Prime Numbers Between 30 To 50

   A. 37 B. 37.8
   C.39 D. 39.8

7. Reeya obtained 65, 67, 76, 82 and 85 out of 100 in different subjects, what will be the average.

   A. 70 B. 75
   C.80 D. 85

8. In the Pakistan-Australia one-day match, due to rain, Pakistan needed 324 runs in 48 overs to win. In initial 10 overs, the average scoring rate was 6, but in next 10 overs it increased to 8.5. It then declined to 5.5 in next 10 overs and again rose to 7

in next 10 overs. To win the match now what average is needed?

A. 8.25 B. 6.75
C. 7.75 D. 7.0

9. Marks of a student were wrongly entered in computer as 83, actual marks of that student were 3. Due to this mistake average marks of whole class got increased by half (1/2). Find the total number of students in that class.

A. 25 B. 30
C. 35 D. 40

10. The average of six numbers is X and the average of three of these is Y. If the average of the remaining three is z, then

A. $x = y + z$ B. $2x = y + z$
C. $x = 2y + z$ D. $x = y + 2z$

SOLUTIONS

Q1.

Correct Answer is B

As the month begin with Sunday, so there will be five Sundays in the month. So result will be:

$= \frac{510 \times 5 \times 240 \times 25}{30} = \frac{8550}{30} = 285$

Q2.

Correct Answer is C

$= \frac{(38.9 \times 10) - (42 \times 6)}{4}$

$= \frac{(1216 - 750)}{4} = 34.25$

Q3.

Correct Answer is C

$= \frac{7(1+2+3+\cdots+10)}{10}$

$= \frac{7(10(10+1))}{10}$

$= \frac{7(110)}{10 \times 2} = 38.5$

Q4.

Correct Answer is B

Average speed will be

$= \frac{2XY}{X+Y}$ km /hr $= \frac{2(50)(30)}{50+30}$ km/hr

= 37.5 km/hr

Q5.

Correct Answer is D

As number of girls and boys is not given so result can't be computed

Q6.

Correct Answer is D

Prime numbers between 30 and 50 are:
31, 37, 41, 43, 47

Average of prime numbers between 30 to 50 will be

$\frac{(31+37+41+43+47)}{5} = \frac{199}{5} = 39.8$

Q7.

Correct Answer is B

$= \frac{(66+67+76+82+85)}{5} = 75$

Q8.

Correct Answer is B.

This is very easy to solve

First we need to see how many runs are scored in 40 overs.

Runs scored in first 10 overs = 6 × 10 = 60

+ Runs scored in next 10 overs = 8.5 × 10 = 85

+ Runs scored in next 10 overs = 5.5 × 10 = 55

+ Runs scored in next 10 overs = 7 × 10 = 70

Total runs scored in 40 overs = 270

Runs needed = 324 – 270 = 54

Overs left = 8

Average needed = 54/8 = 6.75

Q9.

Correct Answer is D

Suppose total number of students are = X

Total increase = $x \times \frac{1}{2} = \frac{x}{2}$

$= \frac{x}{2} = 83 - 63 = 20$

X = 40

Q 10.

Correct Answer is B

$X = ((3y+3z)/6)$

or $2X = y + z$

RATIOS AND PROPORTIONS

Ratio and Proportions is another important topic from HAT test point of view; it can come as an individual question.

Ratio

When two numbers are represented in the form of another; this is done by expressing one number as a fraction of another.

Thus, we have **a:b**; where **a** is the **antecedent**, and **b** is the **consequent**(a little general knowledge doesn't hurt even in math!)

Thus when we write 4:16, it can be re-written as 2:8 and further simplifying it can be said to be 1:4.

Which actually means, the number '4' is 4 times to get the figure 16.

And all of you know, that 1:4 can also be written as ¼.

Ratios to percentages

This 1/4 ratio can be denoted as a percentage too! It's 25% How?

Well, 1/4 × 100 = 25% [$1/4^{th}$ is also known as one quarter, that is one part out of 4 parts.]

2/4 = 1/2 = 50%

3/4 = 75%

and, 4/4 = 100%

Comparing two ratios or fractions

If you are given two fractions, say 5/3 and 7/8, and we need to find out which fraction is greater than the other what do we do?

We can either calculate their percentages,

5/3×100 = 167% and 7/8×100 = 88%

(approximate values)

So we know, that 5/3 is the greater fraction!

Another method can be to compare the two fractions. And to compare we have to make their denominators equal.

To make their denominators equal, for the first fraction, we multiply 8 to both the numerator and denominator. Therefore, the first fraction = 40/24.

The second fraction, by multiplying 3 to make the second fraction = 21/24.

Obviously 40 is greater than 21!

Hence, 40/24 or 5/3 is greater than 21/24 or 7/8!

PROPORTIONS

Proportions is where two ratios are compared and equated.

Where **a:b** is a ratio and ***c:d*** is another ratio, and if they are equal, then, they can be re-written as **a:b :: c:d**. { the '::' sign means 'equal to'}

Therefore, **a:b = c:d**

1:2 :: 7:14 , try out the simplifications!

'a' and 'd' are called extremes as they are in the extreme ends! And 'b' and 'c' are called means as they are in the middle!

Properties of proportions

(i) **a:b = c:d**

can be written as a/b = c/d

which implies, a × d = b × c, or, ad = bc

this property helps in solving many questions

(ii) if **a:b = b:c**, which means this proportions between three numbers is in the form of 'continued proportions', as all three numbers are having a connection.

so, a/b = b/c or,

ac = b × b or,

$ac = b^2$

Topic Drill

1. If in a certain code 3 × 4 = 25 and 6 × 8 = 100 then what is the value of 12 × 5?
   A. 144 B. 169
   C. 154 D. 178

2. If A:B = 2:3 and B:C = 4:3, Then find A:B:C
   A. 8:12:9 B. 2:3:8
   C. 2:3:9 D. 2:3:12

3. There are two numbers and their ratio is 3 : 9. If we subtract 9 from both numbers then their ratio becomes 12 : 13, what is value is smaller number ?
   A. 23 B. 27
   C. 31 D. 33

4. The ratio of numbers of girls and boys participating in sports of a school is 4:5. If the number of girls is 212, determine the number of boys participating in the sports.
   A. 256 B. 265
   C. 251 D. 263

5. If 2 : 9 :: x : 18, then find the value of x
   A. 2 B. 3
   C. 4 D. 6

6. Salaries of Raheem and Shahid are in the ratio 2:3. If the salary of each is increased by Rs. 4000, the new ratio becomes 40:57. What is Shahid present salary?
   A. 32000 B. 34000
   C. 38000 D. 40000

7. A and B together have Rs. 1210. If 4/15 of A's amount is equal to 2/5 of B's amount. How much amount B have?
   A. 484 B. 480
   C. 478 D. 470

8. If three numbers in the ratio 3 : 2: 5 be such that the sum of their squares is 1862, the middle number will be
   A. 10 B. 14
   C. 18 D. 22

9. The three numbers are in the ratio 1/2 : 2/3 : 3/4. The difference between greatest and smallest numbers is 36. Find the numbers.
   A. 72, 84, 108 B. 60, 72, 96
   C. 72, 84, 96 D. 72, 96, 108

SOLUTIONS

Q 1.

Correct Answer is B

Solution: In this question the pattern * represents a code.

$\Rightarrow 3^2 + 4^2 = 25$

$\Rightarrow 6^2 + 8^2 = 100$

$\Rightarrow 12^2 + 5^2 = 169$

Q 2.

Correct Answer is A

A:b = 2:3

$B:c = 4:3 = (4 \times \frac{3}{4} : 3 \times \frac{3}{4})$

$= 3 : \frac{9}{4}$

$A:b:c = 2:3:\frac{9}{4} = 8:12:9$

Q 3.

Correct Answer is D

From question, let's assume that two numbers are 3x and 5x.

Then, $\frac{3x-9}{5x-9} = \frac{12}{23}$

$= 23(3x - 9) = 12(5x - 9)$

$= 9x = 99$

$X = 11$

So numbers are 3(11) = 33, 5(11) = 55.

Smaller number is 33.

Q 4.

Correct Answer is B

As per given condition, $\frac{number\ of\ girls}{number\ of\ boys} = \frac{4}{5}$

$= \frac{212}{number\ of\ boys} = \frac{4}{5}$

Number of boys = 265

Q 5.

Correct Answer is C

Treat 2:9 as 2/9 and x:18 as x/18, treat :: as =

So we get $2/9 = x/18$

$\Rightarrow 9x = 36$

$\Rightarrow x = 4$

Q 6.

Correct Answer is C

Let the original Salaries of Raheem and Shahid is 2x and 3x.

So as per question

$\frac{2x+4000}{3x+4000} = \frac{40}{57}$

$\Rightarrow 57(2x + 4000) = 40(3x+4000) \Rightarrow 6x = 68000 \Rightarrow 3x = 34000$ Shahid Salary $= 3x + 4000 \Rightarrow 34000 + 4000 = 38000$

Q 7.

Correct Answer is A

In this type of question, we will first try to calculate the ratio of two persons. Once we get ratio then we can easily get our answer. So let's solve this.

$\frac{4}{15} A = \frac{2}{5} B$

$A = (\frac{2}{5} \times \frac{14}{4}) B$

$A = \frac{3}{2} B$

$\frac{A}{B} = \frac{3}{2}$

$A : B = 3 : 2$

B's Share $= \frac{2}{5} \times 1210 = 484$

Q 8.

Correct Answer is B

Let the numbers be 3x, 2x and 5x.

Then,

$9x + 4x + 25x = 1862$

$\Rightarrow 38x = 1862$

$\Rightarrow x = 49 \Rightarrow x = 7.$

middle number $= 2x = 14$

Q 9.

Correct Answer is A

Let the common factor be K

So the three numbers are $\frac{K}{2}, \frac{2K}{3}, \frac{3K}{4}$.

Also we know that, greatest – smallest = 36

$= \frac{3K}{4} - \frac{K}{2} = 36$

K = 144

The numbers are $\frac{k}{2} = \frac{144}{2} = 72$

$\frac{2K}{3} = \frac{2 \times 144}{3} = 84$

$\frac{3K}{4} = \frac{3 \times 144}{4} = 108$

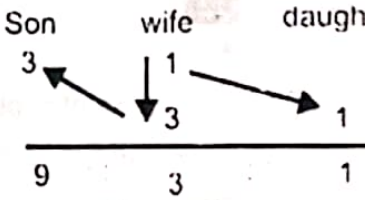
INHERITANCE

Inheritance questions are specially included in HAT test. These questions are actually the questions based on Ratios and proportions. You need not to memorize the proportions of the shares among deceased relatives.

Example

Javed left Rs. 6,000,000 for his only one son and one daughter. If the share of the son is double of the daughter. Then what is the share of the daughter.

Solution



The ratio between the shares of daughter and son is 1 : 2

So, we divide the total amount in three parts,

One share value = 6,000,000/ 3 = 2,000,000

Hence; the share of daughter = 2,000,000

Topic Drill

1. A man divided has property so that his son's share to his wife's share to his daughters are both as in the ratio 3 : 1 if the daughter gets 10,000 less than son, the value (in rupee) of the whole property is

A. 16,250 B. 16,000
C.18,250 D. 17,000

2. A man divides his property so that his son's share to his wife's and wife's share to his daughter are both are in ratio 3:1. If the daughter gets Rs 80,000 less than son, the value (in rupees) of the whole property is

A. 100,000 B. 160,000
C. 130,000 D. 170,000

SOLUTION:

Q1.

Answer is A

Son: wife = 3 : 1 = 9: 3 (given)

Wife : daughter = 3 :1(given)

Son : wife: daughter = 9 :3 :1

Sum of ratios = 9 + 3 + 1 = 13

Let the total wealth be Rs. X, then

Son's Share – daughter's share = 10,000

$= \frac{9x}{13} - \frac{x}{13} = 10{,}000$

$= \frac{9x-x}{13} = 10{,}000$

$X = \frac{13{,}00{,}00}{8} = \text{Rs. } 16250$

Q2.

Answer is C.

This a case of triple ratio.

Total number of shares = 9 + 3 + 1 = 13

The daughter gets 8 shares less than the son, So, 80,000 is equal to 8 shares.

One share = 80,000/8 = 10,000

Total number of shares = 13

Total value of the property = 10,000 × 13 = 130,000

TOPICS OF PREVIOUS MODULES

Revision Drill

1. Number of observations are 30 and value of arithmetic mean is 15 then sum of all values is

A. 15 B. 450
C.200 D. 45

2. The average of 20 numbers is zero. Of them, at the most, how many may be greater than zero?

A. 0 B. 1
C.10 D. 19

3. The average monthly income of P and Q is Rs. 5050. The average monthly income of Q and R is Rs. 6250 and the average monthly income of P and R is Rs. 5200. The monthly income of P is:

A. 3500 B. 4000
C. 4050 D. 5000

4. The average age of husband, wife and their child 3 years ago was 27 years and that of wife and the child 5 years ago was 20 years. The present age of the husband is:

A. 35 years B. 40 years
C.50 years D. None of these

SOLUTIONS

Q 1.

Correct Answer is B

Sum of values = Average × n

= 30 × 15

= 450

Q 2.

Correct Answer is D

Average of 20 numbers = 0.

∴ Sum of 20 numbers (0 x 20) = 0.

It is quite possible that 19 of these numbers may be positive and if their sum is a then 20th number is (-a).

Q 3.

Correct Answer is B

Let P, Q and R represent their respective monthly incomes. Then, we have:

P + Q = (5050 x 2) = 10100 .... (i)

Q + R = (6250 x 2) = 12500 .... (ii)

P + R = (5200 x 2) = 10400 .... (iii)

Adding (i), (ii) and (iii), we get: 2(P + Q + R) = 33000 or P + Q + R = 16500 .... (iv)

Subtracting (ii) from (iv), we get P = 4000.

Therefore; P's monthly income = Rs. 4000.

Q 4.

Correct Answer is B

Sum of the present ages of husband, wife and child = (27 x 3 + 3 x 3) years = 90 years.

Sum of the present ages of wife and child = (20 x 2 + 5 x 2) years = 50 years.

∴ Husband's present age = (90 - 50) years = 40 years.

VERBAL REASONING

ANTONYMS

An antonym is a word opposite in meaning to another word. Antonyms can be of any part of speech; however, the words have to be of the same part of speech in order to be antonyms of each other. Not all words can have an antonym as some words such as chair, bottle, etc. have neutral meanings and hence no opposites.

The instructions on Antonym questions include but are not limited to:

- Find the word which is farthest in meaning to the given word.
- Choose the correct antonym for the term given.

Questions on antonyms consist of a stem word and four or five option words. The test-taker is expected to choose the word from the options which is farthest in meaning to the given word. The test-taker need not find a perfect opposite for the given stem word but the best opposite from the given set of options.

Example

Flamboyant

A. female
B. apparitional
C. plain
D. terse

Solution

The word 'flamboyant' means "highly elaborate". The word 'plain' from the options can thus be identified as the word opposite to this word.

APPROACHES FOR ANSWERING ANTONYM QUESTIONS

Possessing a good vocabulary can help a test-taker identify antonyms of words given. However, there are various strategies and approaches that can help in determining the word farthest in meaning. The following list includes a few approaches and strategies used to arrive at the answer in Antonym questions.

1. Think of a context for the stem word. Use the stem word in an example sentence in this context.
2. Before looking at the choices, think of antonyms for the stem word.
3. Read all the choices before you decide the word farthest in meaning to the stem word.
4. Look at the option words to determine the word's part of speech.
5. Consider secondary meanings of the stem word.
6. Break down unfamiliar words into recognizable parts - prefix, suffix and root word.
7. The connotations (positive or negative) of the antonyms should be opposite to that of the stem word.

Example

Astute

A. distraught
B. careful
C. generous
D. gullible

Solution

'Astute' means 'shrewd' or 'showing acute mental vision'. Option (d) 'gullible' means 'easily duped or cheated'. Hence, it is the word farthest in meaning to the given stem word.

Topic Drill

1. Heartfelt
   A. humorous B. loving C. insincere D. unhealthy
2. Secret
   A. friendly B. overt C. hidden D. ample
3. Withdraw
   A. dislike B. need C. advance D. want
4. Impartial
   A. hostile B. need C. biaseD. D. worrieD.
5. Talent
   A. silent B. show C. confine D. inability
6. Expect
   A. attenD. B. regret C. despair D. loathe
7. Peaked
   A. lack B. ruddy C. tireD. D. pointy
8. Common
   A. strange B. fast C. easy D. quick
9. Awe
   A. shallow B. low C. care D. content
10. Continue
    A. curve B. pause C. carry D. argue
11. Fluid
    A. afraiD. B. solid C. decent D. liquiD.
12. Famous
    A. talent B. boring C. obscure D. poor
13. Detain
    A. release B. silence C. forget D. prosper
14. Flaunt
    A. regarD. B. sink C. hide D. propose
15. Heal
    A. foot B. hope C. save D. maim
16. Labor
    A. amuse B. rest C. strive D. survive
17. Assure

A. alarm B. reassure
C. quiet D. sure

18. Cursed
A. swore B. pious
C. lucky D. clear

19. Pivotal
A. turning B. wavy
C. unimportant D. clear

20. Pacify
A. excite B. foot
C. coddle D. unhanD.

21. Ecstasy
A. hate B. agony
C. languor D. fatigue

22. Enigmatic
A. healthy B. attractive
C. obvious D. mysterious

23. Astute
A. careful B. fantasy
C. colD. D. gullible

24. Knowing
A. wasteful B. clumsy
C. fast D. dense

25. Severe
A. cautious B. join
C. false D. lenient

26. Imaginative
A. playful B. dull
C. small D. written

27. Exact
A. join B. whole
C. incorrect D. sympathetiC.

28. Popular
A. empty B. uncommon
C. famous D. feisty

29. Rough
A. tumble B. fast
C. sleek D. distant

30. Concede
A. sit B. withstand
C. dismiss D. elaborate

SOLUTIONS

Q1.

(C) is correct

Humorous: Humorous is a fine tone for toasting at your friend's wedding, but not so much for the reading of someone's last will and testament. When we talk about humor, we're usually talking about something funny. But originally the word humorous had to do with the body's humors, or moods.

Loving: feeling or showing love or great care

Insincere: not expressing genuine feelings.

unhealthy: not having or showing good health.

Q2

(B) is correct

Friendly: Characteristic of or behaving as a friend

overt: done or shown openly; plainly apparent.

hidden: kept out of sight; concealed

ample: enough or more than enough; plentiful.

Q3.

(C) is correct

Dislike: feel distaste for or hostility towards

Need: require (something) because it is essential or very important rather than just desirable.

Advance: not expressing genuine feelings.

Want: have a desire to possess or do (something); wish for.

Q4

(C) is correct

Hostile: showing or feeling opposition or dislike; unfriendly

Need: require (something) because it is essential or very important rather than just desirable.

Biased : unfairly prejudiced for or against someone or something.

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Worried: anxious or troubled about actual or potential problems.

Q5.

(D) is correct

Silent: not making or accompanied by any sound.

Show: be, allow, or cause to be visible.

Confine: establish the truth or correctness of (something previously believed or suspected to be the case).

Inability: the state of being unable to do something

Q6.

(C) is correct

Attend: be present at (an event, meeting, or function).

Regret: feel sad, repentant, or disappointed over (something that one has done or failed to do).

Despair: the complete loss or absence of hope

Loathe: feel intense dislike or disgust for.

Q7.

(B) is correct

Lack: the state of being without or not having enough of something.

Ruddy: (of a person's face) having a healthy red color.

Tired: in need of sleep or rest; weary.

Pointy: having a pointed tip or end.

Q8.

(A) is correct

Strange: unusual or surprising; difficult to understand or explain

Fast: moving or capable of moving at high speed

Easy: achieved without great effort; presenting few difficulties.

Quick: moving fast or doing something in a short time.

Q9.

(D) is correct

Awe: a feeling of reverential respect mixed with fear or wonder.

Shallow: not exhibiting, requiring, or capable of serious thought.

Low: of less than average height from top to bottom or to the top from the ground

Care: the provision of what is necessary for the health, welfare, maintenance, and protection of someone or something.

Content: in a state of peaceful happiness

Thus **option D** is the correct answer.

Q10.

(B) is correct

Continue: persist in an activity or process.

Curve: a line or outline which gradually deviates from being straight for some or all of its length.

Pause: interrupt action or speech briefly.

Carry: support and move (someone or something) from one place to another

Argue: give reasons or cite evidence in support of an idea, action, or theory, typically with the aim of persuading others to share one's view.

The **option B** is the answer.

Q11.

(B) is correct

Fluid: a substance that has no fixed shape and yields easily to external pressure; a gas or (especially) a liquid.

Afraid: feeling fear or anxiety; frightened.

Solid: firm and stable in shape; not liquid or fluid.

Decent: conforming with generally accepted standards of respectable or moral behavior.

Liquid:

Q12.
(C) is correct

Famous: known about by many people.

Talent: natural aptitude or skill

Obscure: not discovered or known about; uncertain.

Poor: lacking sufficient money to live at a standard considered comfortable or normal in a society

Boring: not interesting; tedious.

Q13.
(A) is correct

Detain: keep (someone) from proceeding by holding them back or making claims on their attention.

Release: allow or enable to escape from confinement; set free.

Forget: inadvertently neglect to do or mention something.

Silence: cause to become silent; prohibit or prevent from speaking.

Prosper: denoting something that is truly what it is said or regarded to be; genuine

Thus **option A** is correct answer.

Q14.
(C) is correct

Flaunt: display (something) ostentatiously, especially in order to provoke envy or admiration or to show defiance

Regard: consider or think of in a specified way

Sink: go down below the surface of something, especially of a liquid; become submerged.

Hide: put or keep out of sight

Propose: put forward (a plan or suggestion) for consideration by others.

Q15.
(D) is correct

Heal: cause (a wound, injury, or person) to become sound or healthy again

Hope: a feeling of expectation and desire for a particular thing to happen.

Save: keep safe or rescue (someone or something) from harm or danger.

Maim: to injure

Q16.
(B) is correct

Labor: work, especially physical work.

Amuse: cause (someone) to find something funny.

Rest: cease work or movement in order to relax, sleep, or recover strength.

Strive: make great efforts to achieve or obtain something.

Thus, **option B** is the correct answer.

Q17.
(A) is correct

Assure: tell someone something positively to dispel any doubts.

Alarm: an anxious awareness of danger.

Reassure: say or do something to remove the doubts and fears of (someone).

Sure: completely confident that one is right.

Thus the **option A** is correct.

Q18.

(C) is correct

Cursed: a solemn utterance intended to invoke a supernatural power to inflict harm or punishment on someone or something.

Clear: easy to perceive, understand, or interpret

Lucky: having, bringing, or resulting from good luck.

Pious: (of a hope) sincere but unlikely to be fulfilled.

Thus **option C** is correct.

Q19.

(C) is correct

Pivotal: of crucial importance in relation to the development or success of something else.

Turning: a place where a road branches off from another.

Unimportant: lacking in importance or significance.

Clear: easy to perceive, understand, or interpret.

Thus **option C** is correct answer.

Q20.

(A) is correct

Pacify: quell the anger, agitation, or excitement of

Foot: the lower extremity of the leg below the ankle, on which a person stands or walks.

Coddle: treat (someone) in an indulgent or overprotective way.

Unhand: release (someone) from one's grasp.

Thus **option A** is correct.

Q21.

(B) is correct

Ecstasy: an overwhelming feeling of great happiness or joyful excitement.

Hate: intense dislike.

Agony: extreme physical or mental suffering

Languor: tiredness or inactivity, especially when pleasurable.

Fatigue: extreme tiredness resulting from mental or physical exertion or illness.

Thus **option B** is the correct answer.

Q22.

(C) is correct

Enigmatic: difficult to interpret or understand; mysterious.

Attractive: pleasing or appealing to the senses

Obvious: easily perceived or understood; clear; self-evident, or apparent

Mysterious: difficult or impossible to understand, explain, or identify

Thus **option C** is correct answer.

Q23.

(D) is correct

Astute: having or showing an ability to accurately assess situations or people and turn this to one's advantage.

Fantasy: the faculty or activity of imagining impossible or improbable things.

Gullible: easily persuaded to believe something; credulous.

The **option D** is correct answer.

Q24.

(B) is correct

Wasteful: (of a person, action, or process) using or expending something of value carelessly, extravagantly, or to no purpose.

Clumsy: awkward in movement or in handling things

Dense: closely compacted in substance.

Thus **option B** is correct answer.

Q25.

(D) is correct

Severe: (of something bad or undesirable) very great; intense.

Join: link; connect.

Lenient: (of a punishment or person in authority) more merciful or tolerant than expected.

Thus **option D** is correct.

Q26.

(B) is correct

Imaginative: having or showing creativity or inventiveness.

Playful: fond of Questions and amusement; light-hearted.

Dull: lacking interest or excitement.

Thus the **option B** is correct.

Q27.

(C) is correct

Exact: not approximated in any way; precise

Join: link; connect.

Incorrect: not in accordance with fact; wrong

Sympathetic: feeling, showing, or expressing sympathy.

The correct **option C** is the answer.

Q28.

(B) is correct

Popular: liked or admired by many people or by a particular person or group.

Empty: containing nothing; not filled or occupied

Uncommon: out of the ordinary; unusual.

Famous: known about by many people

Feisty: (of a person, typically one who is relatively small) lively, determined, and courageous.

Thus **option B** is correct.

Q29.

(C) is correct

Rough: having an uneven or irregular surface; not smooth or level.

Tumble: fall suddenly, clumsily, or headlong.

Sleek: (of hair, fur, or skin) smooth and glossy.

Distant: far away in space or time.

Thus **option C** is correct.

Q30.

(B) is correct

Concede: admit or agree that something is true after first denying or resisting it.

Dismiss: order or allow to leave; send away.

Elaborate: involving many carefully arranged parts or details; detailed and complicated in design and planning.

Thus the **option B** is correct.

Revision Drill

ANALYTICAL REASONING

Question 1 to 5 Based on this statement

Nine engineers are working on new ideas for nuclear fusion for a power company. Each engineer is well respected in the fusion field, but the power company has only enough money to experiment with a certain number of ideas. Therefore, an executive of the company ranks the tenability of the ideas in order to decide which ones should receive funding. Lower rankings correspond to higher levels of tenability. Therefore, lower rankings are more likely to receive funding.

The ideas of the engineers Anna, Bala, Chand, Danial, Evan, Fraz, Gull, Hassan, and Iris are ranked according to the following conditions:

Fraz's idea is after Gull's and Danial's.

Hassan's idea is after Bala's.

Anna's idea is after Chand's and before Hassan's.

Evan's idea is before Bala's and after Chand's.

Danial's idea is after Bala's.

1. Which of the following could be a ranking of the engineers from those whose ideas are most likely to those whose ideas are least likely to receive funding?
   A. Chand. Iris, Evan, Bala, Hassan, Anna, Danial, Gull, Fraz.
   B. Gull, Chand, Anna, Evan, Iris, assan, Danial, Fraz, Bala.
   C. Iris, Gull, Chand, Anna, Evan, Bala, Hassan, Danial, Fraz.
   D. Chand, Evan, Bala, Anna, Hassan, Iris, Gull, Fraz, Danial.
   E. None of the above.

2. If Danial's idea is ranked fourth, then which of the following must be true?
   A. Anna's is fifth.
   B. Bala's is third.
   C. Fraz's is ninth.
   D. Hassan's is fifth.
   E. None of the above.

3. If Gull's idea is ranked second, then which of the following must be true?
   A. Fraz's is ninth.
   B. Chand's is first.
   C. Evan's is fourth.
   D. Hassan's is sixth.
   E. None of the above.

4. If Iris, Danial, Anna, and Gull have their ideas ranked consecutively, then which of the following must be true?
   A. Anna's is ranked fourth, fifth, or sixth.
   B. Danial's is ranked sixth or seventh.
   C. Bala's is anked second or fourth.
   D. Hassan's is ranked eighth or ninth.
   E. None of the above.

5. How many people's ideas could be ranked fifth?
   A. five
   B. six
   C. seven
   D. eight
   E. nine

Question 6 to 10 Based on this statement

Eight penguins named Anna, Bala, Chand, Danial, Evan, Fraz, Gull, and Hassan, all waddle down the fake ice at the San Diego zoo. After waddling to the edge of the ice, they all dive into the pool to play a Question of underwater chase. The chasing Question forms a big underwater line that stays constant for the duration of the Question.

The order of penguins in the chasing line is governed by the following rules:

Anna is before Danial.

Hassan is after Gull and Bala.
Chand is after Gull.
Danial is before Fraz and Evan.
Evan is before Gull and Bala.

6. Which of the following could be the order of the penguins in the chasing line?

A. Bala, Anna, Danial, Fraz, Evan, Gull, Chand, Hassan.
B. Fraz, Anna, Danial, Evan, Gull, ala, Hassan, Chand
C. Anna, Danial, Evan, Fraz, Gull, Bala, Hassan, Chand
D. Gull, Evan, Danial, Fraz, Anna, Bala, Hassan, Chand
E. Chand, Anna, Danial, Evan, Fraz, Gull, Bala, Hassan

7. How many penguins could be fourth in the line?

A. two B. three
C.four D. five
E.six

8. If Fraz goes fifth, then which of the following could NOT be true?

A. Bala goes fourth.
B. Gull goes sixth.
C. Bala goes seventh.
D. Gull goes seventh.
E. Chand goes seventh.

9. If Chand goes seventh, then which of the following must be true?

A. Hassan goes eighth.
B. Evan goes third.
C. Gull goes sixth.
D. Bala goes fourth.
E. Danial goes second.

10. If Bala goes after Chand, then which of the following must be true?

A. Bala goes seventh.
B. Hassan goes eighth.
C. Chand goes fifth or sixth.
D. Fraz goes third or fourth.
E. Evan goes fourth or fifth.

Hints for Question 1 to 5 Explanation

1.	**Transcribe the Constraints.** Use only "less than" signs.
	1. G < F < D 2. B < H 3. C < A < H 4. C < E < B 5. B < D Reconcile the direction of the diagram. More likely to get funding < Less likely to get funding
2.	**Add Logic Chains Together** A < H C < E < B < D < F G
3.	**Determine the Implications of the Logic Map.** Notice that there are no constraints on Iris. She could literally be anywhere on the following line: 1 2 3 4 5 6 7 8 9

Q1.

Which of the following could be a ranking of the engineers from those whose ideas are most likely to those whose ideas are least likely to receive funding?

(C) This is a possible order.

(A) Anna's must be before Hassan's.

(B) Hassan's must be after Bala's.

(D) Danial's must be before Fraz's.

(E) **C** is the answer.

Q 2.

If Danial's idea is ranked fourth, then which of the following must be true?

(B) If Danial's idea is ranked fourth, then Chand's must be first, Evan's must be second, and Bala's must be third. Because of the presence of Iris, we cannot really tell about the

configuration of the rest of the Question, only that her idea is excluded from the first four positions.

Q 3.

If Gull's idea is ranked second, then which of the following must be true?

(E) If Gull's idea is second, then Iris's or Chand's must be first and Fraz's, Hassan's, or Iris's must be last. We can tell very little about the rest of the Question, though.

Q 4.

If Iris, Danial, Anna, and Gull have their ideas ranked consecutively, then which of the following must be true?

(D) In this scenario, Fraz and Hassan would have to have their ideas ranked eighth and ninth (not necessarily in that order).

Q 5.

How many people's ideas could be ranked fifth?

(C) Chand and Fraz are the only two people whose ideas could not be ranked fifth. This means that seven people's ideas could be fifth.

Hints for Question 6 to 10 Explanation

1.	**Transcribe the Constraints.** Use only "less than" signs. 1. A < D 2. G < H, B < H 3. G < C 4. D < F, D < E 5. E < G, E < B Reconcile the direction of the diagram. Beginning of line < End of line
2.	**Add Logic Chains Together**
	A < D < E < F, G < C, G < H, B < H
3.	**Determine the Implications of the Logic Map.** The background of this map is once again a numbered line: _ _ _ _ _ _ _ _ 1 2 3 4 5 6 7 8 Notice that Anna must always be first and Danial must always be second, but Fraz, Chand, or Hassan could be last.

Q 6.

Which of the following could be the order of the penguins in the chasing line?

(C) Anna must be first.

Q 7.

How many penguins could be fourth in the line?

(C) Fraz, Gull, Bala, or Evan could be fourth in the line.

Q 8.

If Fraz goes fifth, then which of the following must NOT be true?

The following diagram corresponds to this situation. Notice the introduction of the double possibilities, which we will discuss more in depth in the next chapter:

A	D	E	G	F	C	B	H
1	2	3	4	5	6	7	8

A	D	E	G	F	B	C/H	H/C
1	2	3	4	5	6	7	8

A	D	E	B	F	G	C/H	H/C
1	2	3	4	5	6	7	8

The H/C denotes that either Hassan or Chand could go in that spot. This is called a double possibility. If Chand goes there, then Hassan must go in the other spot where the double possibility is in the Question.

(D) Gull cannot go seventh in any diagram, because both Hassan and Chand must go after him.

(A) This can happen in the third diagram.

(B) This can happen in the third diagram.

(C) This can happen in the first diagram.

(E) This can happen in either the second or the third diagram.

Q 9.

If Chand goes seventh, then which of the following must be true?

(E) If Chand goes seventh, then either Fraz or Hassan could go eighth. Hassan, Fraz, Gull, or Bala could go sixth. You already know that Anna must go first and Danial must go second.

Q 10.

If Bala goes after Chand, then which of the following must be true?

This is a very open-ended question, because it tells you the relative order of several variables but not exactly where they go in the Question. The process of elimination is the best method for finding the right answer choice in this situation.

(C) You know that Chand must go fifth or sixth.

(A) Bala could go seventh, but he could also go earlier in the line.

(B) Fraz could also go eighth.

(D) Fraz could really go anywhere after Danial in the Question.

(E) Evan could go third.

QUANTITATIVE REASONING

1. The ages of the two persons differ by 20 years. If 5 year ago, the older one be 5 times as old as the younger one, then their present ages, in year are:
   A. 25, 5 B. 30, 10
   C. 35, 15 D. 50, 30

2. A man arranges to pay off a debt of Rs 3600 by 40 annual installments which are in A.P. When 30 of the installments are paid he dies leaving one-third of the debt unpaid. The value of the 8th installment is.
   A Rs 35 B Rs 50
   C Rs 65 D Rs 70

3. A student was asked to divide a number by 6 and add 12 to the quotient. He however first added 12 to the number and then divided it by 6, getting 112 as the answer. The correct answer should have been :
   A 114 B 118
   C. 122 D. 124

4. What is the average of first 19 positive integers?
   A. 8 B 9
   C. 10 D. 11

5. The average of two numbers is 10. If one of the numbers is 7, then what is the value of the other number?
   A. 13 B. 10
   C. 7 D. 9

6. The average of first five multiples of 3 is:
   A. 8 B. 9
   C. 10 D. 11

7. There are two sections A and B of a class, consisting of 36 and 44 students' respectively. If the average weight of section A is 40kg and that of section B is 35kg, find the average weight of the whole class.
   A. 30.00 kg B. 35.00 kg
   C. 37.25 kg D. 42.50 kg

8. The distance between two stations A and B is 778 km. A train covers the journey from A to B at 84 km per hour and returns back to A with a uniform speed of 56 km per hour. Find the average speed of train during the whole journey.
   A. 60.3 km/hr B. 35.0 km/hr
   C. 57.5 km/hr D. 67.2 km/hr

9. A sum of money is to be distributed among AA, BB, CC, DD in the proportion of 5:2:4:3. If CC gets Rs. 1000 more than DD, what is BB's share?
   A. Rs. 500 B. Rs. 1500
   C. Rs. 2000 D. None

10. A and B together have Rs. 1210. If 4/15 of A 's amount is equal to 2/5 of B 's amount, how much amount does B have?
    A Rs 460 B. Rs 484
    C. Rs 550 D. Rs 664

SOLUTION:

Q1.

Option(**B**) is correct

Let the age be x and y years now.

Then, x−y=20 -------- (i)

and (x−5)=5(y−5) ------- (ii)

On solving both equations we get:

x=30x=30 and y=10

Q2.

Option(**C**) is correct

Let the first installment be 'aa' and the common difference between any two consecutive installments be 'd $\bar{d}$.
Using the formula for the sum of an A.P.

$S=\frac{n}{2}[2a + (n-1)d]$

We have,

$3600 = \frac{40}{2}[2a + (40-1)d]$

$180 = 2a + 39d \rightarrow (1)$

And $2400 = \frac{30}{2}[2a + (30-1)d]$

$160 = 2a + 29d \rightarrow (2)$

On solving both the equations we get

$d = 2$ and $a = 51$

value of 8th installment;

$=51 + (8-1)\,2 =$ Rs. 65

Q3.

Option(**C**) is correct
Let the number be xx, then operations undertook by the student:

$=(\frac{x+12}{6}) = 112$

$X = 660$

Correct answer = $\frac{660}{6} + 12 = 122$

Q4.

Correct Answer is C.

For equally spaced values, the average = (First Value + Last Value)/2

Hence; (1 + 19)/2 = 10

Q5.

Correct answer is A.

If the average of the two numbers is 10, then the sum of the two must be equal to 20. Its mean if one number is 7 then the second number is 13.

Q6.

Option(**B**) is correct
Basic Formula: 1,2,3...n
If n is odd, the formula is $(\frac{n+1}{2})^{th}$ term
The five multiples of 3 is 3, 6, 9 17 15
$(\frac{n+1}{2}) = (\frac{5+1}{2})^{th}$ term
$(\frac{6}{2})^{th}$ term = 3rd term
Here 3rd term is 9

Q7.

Option(**C**) is correct
Total weight
of (36+44=80)(36+44=80) Students =(36×40+44 ×35)=(36×40+44×35) kg = 2980 kg
Therefore, average weight of the whole class = (2980/80) kg
Therefore, average weight = **37.25kg**

Q8.

Option(**D**) is correct
Average speed = $\left(\frac{2xy}{x+y}\right) km/hr$
$=(\frac{2\times84\times56}{84+56})$
$=(\frac{2\times84\times56}{140})$ = 67.2 km/hr

Q9.

Option(**C**) is correct
Let the shares of A, B, C and D be Rs. 5x, Rs. 2x, Rs. 4x and Rs. 3x respectively.
Then, 4x−3x=1000
⇒x=1000⇒x=1000.
B's share =Rs.2x=Rs.(2×1000) = **Rs.** 2000

Q10.

Option(**B**) is correct
Given
$\frac{4}{15}\times A = \frac{2}{5} \times B$
$A = \frac{3}{2} \times B$
$\frac{A}{B} = \frac{3}{2}$
B's share = Rs.1210 $\times \frac{2}{5}$ = Rs.484

VERBAL REASONING

Analogies

1. Sound : Muffled
   A. Moisture : Humid
   B. Color : Faded
   C. Despair : Anger
   D. Odor : Pungent

2. Platform : Train
   A. Airplane : Aerodrome
   B. Hotel : Tourist
   C. Quay : Ship
   D. Footpath Traveler

3. Train : Track
   A. Water : Boat
   B. Bullet : Barrel
   C. Idea : Brain
   D. Fame : Television

4. Chalk : Blackboard
   A. Type : Point
   B. Table : Chair
   C. Door : Handle
   D. Ink : Paper

5. Rectangle : Pentagon
   A. Side : Angle
   B. Diagonal : Perimeter
   C. Triangle : Rectangle
   D. Circle : Square

Antonyms

6. HUBBUB
   A. Gaucherie
   B. Lumber
   C. Equanimity
   D. Epistle
   E. Dolt

7. ARRANT:
   A. Cozen
   B. Inconsistent
   C. Palatial
   D. Misogynist

8. STYGIAN:
   A. Cheerful
   B. Turpitude
   C. Prudish
   D. Nonplused

9. GARNISH
   A. Involute
   B. Florid
   C. Hone
   D. Divest

10. IMPUGN
    A. Vitiate
    B. Trite
    C. Streak
    D. Uphold

SOLUTION:

Q1.
Option **B**
Second is the process of gradual disappearances of the first.

Q2.
Option **C**
Second is the place where first stops.

Q3.
Option **B**
As Train is guided by the track similarly Bullet is guided by the barrel.

Q4.
Option **D**
As chalk is used to write on the blackboard similarly the Ink is used to write on the paper.

Q5.
Option **C**
Second one had one more side than the first.

Q6.
The best answer is C.
Hubbub is noise, confusion. Equanimity is the antonym.

Gaucherie is a socially awkward, tactless behavior.
To Lumber means to move in a clumsy, noisy way.
An Epistle is a letter.
A Dolt is a stupid person.

Q7.

The best answer is B.
Arrant is thorough. The antonym is Inconsistent.
To Cozen is to cheat.
To Plunge is to move quickly, suddenly and with force.
Palatial is magnificent.
A Misogynist is a person who hates females.

Q8.

The best answer is A.

Stygian means dark, gloomy. Cheerful is the antonym.

Turpitude means wickedness.

Prudish means easily shocked.

Nonplused means greatly surprised.

Ineffable is too great to be described in words

Q9.

The best answer is D.

To Garnish is to decorate. To Divest is to strip, make bare and is the antonym.

Involute means complex.

Florid means reddish.

A Hone is a stone used for sharpening tools.

Verve means spirit, vigor.

Q10.

The best answer is D.

To Impugn means to assail to attack. To Uphold means to defend and is the antonym.

To Renovate means to restore something to better condition.

To Vitiate is to weaken the strength.

Trite is not new. To Streak means to move very fast.

VOCABULARY

Following is a list of English words with meaning. You are advised to memorize all these words. All these words will be used in the Verbal section in the next module.

Word	Common Meaning
Abeyance	A state of temporary disuse or suspension
Abridge	Shorten (a book, film, speech, etc.) Without losing the sense.
Appease	Pacify or placate (someone) by acceding to their demands.
Astute	Having or showing an ability to accurately assess situations or people and turn this to one's advantage.
Blend	Mix (a substance) with another substance so that they combine together.
Chimney	A vertical channel or pipe which conducts smoke and combustion gases up from a fire or furnace and typically through the roof of a building.
Condemnation	The expression of very strong disapproval; censure.
Consolidated	Make (something) physically stronger or more solid. "the first phase of the project is to consolidate the outside walls"
Credulity	A tendency to be too ready to believe that something is real or true.
Defunct	No longer existing or functioning.
Deluge	A severe flood.
Embroil	Involve (someone) deeply in an argument, conflict, or difficult situation.
Epitome	A person or thing that is a perfect example of a particular quality or type.
Erroneous	Wrong; incorrect.
Exemplar	A person or thing serving as a typical example or appropriate model.
Garrulity	Excessive talkativeness, especially on trivial matters.
Grandiloquent	Pompous or extravagant in language, style, or manner, especially in a way that is intended to impress.

Gregarious	(of animals) living in flocks or loosely organized communities
Illustrate	Provide (a book, newspaper, etc.) With pictures
Insolent	Showing a rude and arrogant lack of respect. "she hated the insolent tone of his voice"
Loquaciousness	Talking or tending to talk much or freely; talkative; chattering
Magniloquent	Using high-flown or bombastic language.
Mediocre	Of only average quality; not very good.
Misprize	Fail to appreciate the value of (something); undervalue.
Obscure	Not discovered or known about; uncertain.
Oppressive	Inflicting harsh and authoritarian treatment.
Pandemonium	Wild and noisy disorder or confusion; uproar.
Parochial	Relating to a church parish.
Perspicuous	Clearly expressed and easily understood; lucid.
Rigorous	Extremely thorough and careful.
Shabby	In poor condition through long use or lack of care.
Shorten	Make or become shorter.
Traduce	Speak badly of or tell lies about (someone) so as to damage their reputation.
Vicissitude	A change of circumstances or fortune, typically one that is unwelcome or unpleasant.
Vindication	The action of clearing someone of blame or suspicion.
Virulent	(of a disease or poison) extremely severe or harmful in its effects.

MODULE || 04

Analytical Reasoning

- Dealing Grouping with solved examples and Practice Drill.

Quantitative Reasoning

- Percentage
- Profit and Loss
- Inheritance
- Solved Practice Drill

Verbal Reasoning

- Antonyms – Techniques and Practice questions, Solved Practice Drill.

Vocabulary

- Vocabulary to memorize (This vocabulary will be used in solving verbal questions in the next module)

ANALYTICAL REASONING

DEALING GROUPING ORDRING WITH SOLVED DRILLS

Grouping questions can be classified as those that partition the elements into 2 groups, and those that partition the elements into 3 or more groups. The former is sometimes called selection questions because they "select" elements from a pool, dividing the pool into two groups: those selected and those not selected. The example on the next page will illustrate.

Example

The starting line-up for the Olympic basketball "Dream Team" is chosen from the following two groups:

Group A	Group B
Jamal, Dar, Uqab, Junaid, Esa	Liaqat, Raheem, Junaid, Maria, Pervaiz

The following requirements must meet:

Two players are chosen from Group A, and three from Group B.

Junaid starts only if Uqab starts.

Dar and Uqab do not both start.

If Junaid starts, then Maria does not.

Exactly 3 of the four fast-break specialists—Jamal, Uqab, Junaid, Pervaiz - must be chosen.

1. If Junaid starts, which of the following must also start?

   A. Maria or Jamal
   B. Dar or Liaqat
   C. Dar or Jamal
   D. Jamal or Pervaiz
   E. Maria or Raheem

2. All of the following pairs of players can start together EXCEPT

   A. Esa and Dar
   B. Junaid and Jamal
   C. Raheem and Jamal
   D. Jamal and UqaB.
   E. Pervaiz and Maria

3. If the condition "Uqab starts only if Pervaiz doesn't" is added to the other conditions, then which of the following must be false.

   A. Jamal starts with Uqab
   B. Liaqat starts with Maria
   C. Liaqat starts with Uqab
   D. Junaid starts with Raheem
   E. Junaid starts with Uqab

SOLUTION:

Hint for explanation

This problem is rather convoluted because not only are there direct conditions on the players, such as

"Dar and Uqab do not both start," but there are also constraining numerical conditions, such as *"exactly three fast-break specialists must be chosen."*

It is best to solve this problem without a diagram; however, we will still symbolize the conditions for clarity and easy reference. The condition *"Junaid starts only if Uqab starts"* implies only that if Junaid is starting then Uqab must be starting as well. So we symbolize it as **Junaid—>Uqab**. The condition *"Dar and Uqab do not both start"* means that if one starts then the other does not. So we symbolize it as **Dar—>~Uqab**. Students often misinterpret this condition to mean that neither of them starts. To state that neither starts, put *both* at the beginning of the sentence: *Both* Dar and Uqab do not start.

The condition *"if Junaid starts, then Maria does not"* is naturally symbolized as

Junaid—>~Maria. It tells us that if J starts then M does not, but tells us nothing when M does not start.

Such a condition, where the two parts of an *if-then* statement do not similarly affect each other, is called a nonreciprocal condition. On the other hand, a condition such as Junaid<—>~Maria affects J and M

equally. In this case, we are told that if J starts then M does not as before, but we are told additionally that if M does not start then J does. It is important to keep the distinction between reciprocal and nonreciprocal relations clear; a common mistake is to interpret a nonreciprocal relation as reciprocal. The remaining conditions cannot be easily written in symbol form, but we will paraphrase them in the schematic:

Junaid—>Uqab

Dar—>~Uqab

Junaid—>~Maria

2 from Group A 3 from Group B

fast-break specialists: Jamal, Uqab, Junaid, Pervaiz

3 fast-break specialists

Esa, Liaqat, Raheem are "wild"

Note: Esa, Liaqat, and Raheem are independent because there are no conditions that refer directly to them. We now turn to the questions.

SOLUTION

Q 1.

From the condition **Junaid—>Uqab**, we know that if Junaid starts, then Uqab must start as well. Now both Junaid and Uqab are fast-break specialists, and three of the four fast-break specialists must start. So at least one of the remaining fast-break specialists—Jamal or Pervaiz—must also start. The answer is (D).

Q 2.

We shall use the method of indirect proof to solve this problem: That is, assume that a particular answer choice is true. Then check whether it leads to a contradiction or an impossible situation. If so, it is the answer; if not, then select another answer-choice and repeat the process until a contradiction is found.

Begin with choice (A). Both Esa and Dar are from Group A, so the remaining 3 starters must

be chosen from Group B. Additionally, they must all be fast-break specialists since neither E nor D is—

there are exactly 3 fast-break specialists. However, Junaid and Pervaiz are the only fast-break specialists in Group B. So the third fast-break specialist cannot be chosen. The answer therefore is (A). This type of question can be time consuming because you may have to check all the answer-choices—save these questions for last.

Q 3.

This problem is both long and hard. Again, we use an indirect proof. Start with (A). Both Jamal and Uqab are from Group A, and both are fast-break specialists. So the remaining 3 starters must be chosen from Group B, one of which must be a fast-break specialist. Now if Junaid, Raheem, and Liaqat are chosen, there will be three fast-break specialists and none of the initial conditions will be violated. So (A) is not necessarily false; eliminate it. Next, we check (B). Both Liaqat and Maria are from Group B, and neither is a fast-break specialist. So the three remaining starters must all be fast-break specialists, and two of them must be from Group A—Jamal and Uqab. This leaves only Junaid and Pervaiz to choose from. Junaid cannot be chosen because Maria has already been chosen (**Junaid—>~Maria**), and from the new condition Pervaiz cannot be chosen because Uqab has already been chosen. Hence the answer is (B).

Topic Drill

Question 1 to 6 are based on following statement

In a local pet store, seven puppies wait to be introduced to their new owners.

The puppies, named A, B, C, D, E, F, and G, are all kept in two pens.

Pen 1 holds three puppies, and pen 2 holds four puppies.

Each potential owner will choose a puppy from one of the two pens.

If G is kept in pen 1, then D is not kept in pen 2.

If D is not kept in pen 2, then G is kept in pen 1.

If A is kept in pen 2, then B is not kept in pen 2.

If B is kept in pen 1, then A is not kept in pen 1.

Questions

1. Which of the following groups of puppies could be in pen 2?
   A. G, D, C, E.
   B. B, G, A, D.
   C. A, ull, D.
   D B, C, E, F.
   E. G, A, F, E

2. If E shares a pen with F, then which of the following must be true?
   A. G is in pen 1 with D.
   B. C is in pen 2.
   C. B is in pen 2 and F is in en 1.
   D. E is in pen 1.
   E. G shares a pen with B.

3. If E and F are in different pens, then which of the following must NOT be true?
   A. F shares a pen with C
   B. G shares a pen with A.
   C. E is n a higher-numbered pen than B.
   D. B shares pen 2 with E and D.
   E. C is in a higher-numbered pen than F.

4. We would know the identities of all the puppies in pens 1 and 2 if we knew that which of the following puppies shared pen 1 with B?
   A. A
   B. C
   C. E
   D. D
   E. F

5. If E shares a pen with G, then which of the following could be true?
   A. B shares a pen with A.
   B. E shares a pen with F.
   C. D oes not share a pen with A or G.
   D. F shares a pen with C.
   E. B shares pen 1 with D.

6. If A shares a pen with G, then which of the following could NOT be true?
   A. C and E share pen 2
   B. F shares pen 1 with B.
   C. Dhares pen 2 with E.
   D. E shares pen 2 with B.
   E. A shares pen 1 with F.

Question 7 to 12 are based on following statement

Three groups of children from the group A, B, C, D, E, F, G, Habib, and Iris are assigned to three different lemonade stands.

Exactly three children staff each stand, and the compositions of the groups taking care of the **stands are determined by the following constraints:**

D is assigned to stand 3.

E is assigned to the same stand as F.

If A is assigned to stand 1, then E is assigned to stand 2 and

C is assigned to stand 3.

If B is assigned to stand 2, then G is assigned to stand 1 and C is assigned to stand 1.

G is not assigned to the same stand as D.

7. Which of the following is not a group that could be assigned to stand 2?
   A. G, Habib, Iris.
   B. G, F, E.
   C. C, A, Habib.
   D. E, B, ull.
   E. Habib, Iris, G.

8. If A and B are assigned to stand 2, then which of the following must NOT be true?
   A. E is assigned to stand 1.
   B. Habib is assigned to stand 1.
   C. G is ssigned to stand 1.
   D. Iris is assigned to stand 1.
   E. C is assigned to stand 1.

9. If F is assigned to stand 1, then which of the following could NOT be true?
   A. A is assigned to stand 1.
   B. B is assigned to stand 3.
   C. G is ssigned to stand 2.
   D. C is assigned to stand 1.
   E. Habib is assigned to stand 2.

10. If A does not share a stand with D or G, then which of the following must be true?
    A. A shares a stand with B.
    B. C shares a stand with E.
    C. Iris shares a stand with Habib.
    D. Habib does not share a stand with D.
    E. F shares a stand with E.

11. If F shares a stand with A, then which of the following must be true?
    A. A is assigned to stand 3.
    B. Habib is assigned to stand 2.
    C. G is assigned to stand 1.
    D. Iris is assigned to stand 3.
    E. B is assigned to stand 3.

12. If Iris and Habib are assigned to stand 1, then which of the following could NOT be true?
    A. C is assigned to stand 1.
    B. B is assigned to stand 2.
    C. E is assigned to stand 3.
    D. F is assigned to stand 2.
    E. G is assigned to stand 1.

Question 13 to 18 are based on following statement

At a park, there are three small picnic tables. Tables 1 and 2 each seat three people. Table 3 seats only one person, since two of its seats are broken. A, B, C, D, E, F, and G all sit at seats at these picnic tables. Who sits with whom and at which table are determined by the following constraints:

C does not sit at the same table as G.

E does not sit at the same table as D.

F does not sit at the same table as C.

A does not sit at the same table as B.

G does not sit at the same table as F.

13. Which of the following is a list of people who could sit together at table 2?
    A. B, F, C.
    B. G, E, A.
    C. C, G, D.
    D. F, D, E.
    E. B, E, A.

14. If F sits at table 3 and D sits at table 2, then which of the following pairs could share a table?
    A. A, B.
    B. D, E.
    C. C, F.
    D. B, G.
    E. A, F.

15. If C cannot sit at a table with B or A, then which of the following must NOT be true?
    A. E sits at table 2.
    B. A sits with G.
    C. F sits at table 3.
    D. G sits with B.
    E. E sits with A.

16. If C shares a table with E and G shares a table with A, then which of the following could be true?
    A. E shares table 1 with B.
    B. G shares table 2 with E.

C. F shares table 1 with B.
D. B shares table 3 with A.
E. D shares table 2 with C.

17. If A does not share a table with D or G, then which of the following could NOT be true?

A. D sits at table 1.
B G sits at table 3.
C. B shares a table with D.
D. G shares a table with E.
E. C shares a table with A.

18. How many different people could potentially sit at table 3?

A. three
B. four
C.five
D. six
E.seven

Hint for Explanation Question 1 to 6

5. **Transcribe the Constraints**

1. **Sufficient-Necessary:**

$$G_1 \rightarrow D_2 \quad ; \quad D_1 \rightarrow G_2$$

Notice that since there are only two groups for the variables to be placed in, $D_1 = D_2$. In the same way, $G_1 = G_2$. So this rule can be represented as follows:

$$G_1 \rightarrow D_1 \quad ; \quad D_2 \rightarrow G_2$$

Keep this in mind for all sufficient-necessary conditions in future grouping games. There are several more in this very game where this rule holds true.

2. **Sufficient-Necessary:**

$$D_1 \rightarrow G_1 \quad ; \quad G_2 \rightarrow D_2$$

3. **Sufficient-Necessary:**

$$A_2 \rightarrow B_1 \quad ; \quad B_2 \rightarrow A_1$$

4. **Sufficient-Necessary:**

$$B_1 \rightarrow A_2 \quad ; \quad A_1 \rightarrow B_2$$

The sufficient-necessary rules can all be added together to make two grouping rules. The sufficient necessary rules regarding G and D basically make it so that when either G or D is in pen 1, the other is also in pen 1. The same is true of pen 2: whenever G or D is in pen 2, the other puppy must also be there. This leads to the following mapping constraint:

G = D

For the sufficient-necessary conditions regarding A and B, you see that whichever pen one puppy is in, the other must be in the other pen. This is equivalent to the following mapping constraint:

$A \neq B$

6.	**Draw a Diagram.** *Write out the vacancy occupancy rules.* The mapping constraint regarding AB allows you to draw in the following double possibility: 1 2 A B B A — — — — — **Is there a burdensome constraint?** Not really, but you should see that there are only two places for the DG mapping constraint to go, so you should draw in these scenarios now, because they will be helpful and you will more than likely need to do so later in the game. 1 2 1 2 A B B A A B B A D — — D G — — G — —
7.	**Make a Hierarchy of Consolidated Constraints.** In this case, you have already included all of your constraints in the two preceding scenarios. However, you see that you did consolidate the four sufficient necessary constraints by turning them into two mapping constraints. If you were solving a game in which you were not able to include any of these mapping constraints in the diagram, then you would include them in this step to keep in mind for when you began answering the questions.

Q1.

Which of the following groups of puppies could be in pen 2?

(D) This grouping is possible in the first scenario.

(A) A and B cannot share pen 1.

(B) A and B cannot share pen 2.

(C) There must be four puppies in pen 2.

(E) G must share a pen with D.

Q2.

G shares a pen with B if G is in pen 1 then D is also in pen 1. If B is in pen 1, then A is in pen 2, therefore there can be 3 pets in pen 1 and rest of the four can be in pen 2 without violating any condition.

Q 3.

If E and F are in different pens, then which of the following must NOT be true?

(E) This constraint is possible only in scenario 2. At most, C can share a pen with F or be in a lower-numbered pen.

Q4.

We would know the identities of all the puppies in pens 1 and 2 if we knew that which of the following puppies shared pen 1 with B?

(D) If D were in pen 1 with B, then you would know that G was in the same pen and all the other puppies were in pen 2.

Q5.

If E shares a pen with G, then which of the following could be true?

(D) This constraint is possible only in scenario 2:

1	2
A B	B A
C	D
F	G
	E

Q6.

If A shares a pen with G, then which of the following could NOT be true?

(E) If A shares pen 1 with G, then D would take the last space in pen 1 due to the FG mapping constraint, leaving no space for F.

Hint for Explanation Question 7 to 12

1.	**Transcribe the Constraints** 1. Direct Placement: $D - 3$ 2. Grouping: $E - F$ 3. Grouping: $G \neq D$ 4. Sufficient-Necessary: $A_1 \rightarrow E_2$: $\overline{E_2} \rightarrow \overline{A_1}$ $A_2 \rightarrow C_1$: $\overline{C_1} \rightarrow \overline{A_2}$ 5. Sufficient-Necessary: $B_2 \rightarrow G_1$: $\overline{G_1} \rightarrow \overline{B_2}$ $B_2 \rightarrow C_1$: $\overline{C_1} \rightarrow \overline{B_2}$
2.	**Draw a Diagram.** *Write out the vacancy occupancy rules.* In this game, the contrapositives of the sufficient-necessary constraints are not likely to be very influential; in fact, they yield repetitive information. For this reason, they are not included in the diagram. This will not always be true of contrapositives, but normally any sufficient-necessary constraint that has all negative variables will not be very influential on grouping games with *more than* two groups. If there were only two groups, then two negative variables could be translated to positive variables: $\overline{D_1} \rightarrow \overline{G_1}$ - $\overline{D_2} \rightarrow \overline{G_2}$. But otherwise, you should pay attention to sufficient-

	necessary chains only when at least one of the variables is positive; this will still allow you to stay apprised of all information. If both variables are negative, then just take the contrapositive with the positive variables and use that in your diagram. **Is there a burdensome constraint?** Not really. This game is extremely open, so you should rank the constraints that are not adequately included on your diagram in the order of their probable influence.
3.	**Make a Hierarchy of Consolidated Constraints.** 1. E = F 2. G ≠ D The sufficient-necessary constraints have already been noted on the diagram, so you need to be sure to be aware of them if A goes in group 1 or if B goes in group 2.

Q7.

Which of the following is not a group that could be assigned to stand 2?

(D) If B is assigned to stand 2, then G must be assigned to stand 1, so G, B, and E cannot share stand 2 and F has to be at the same stand as E.

Q 8.

If A and B are assigned to stand 2, then which of the following must NOT be true?

(A) E cannot be assigned to stand 1. Notice that G and C must be at stand 1 so F cannot be at that stand with E. Here is a diagram of this situation:

Q 9.

If F is assigned to stand 1, then which of the following could NOT be true?

(A) A cannot be assigned to stand 1, because that would require E to be assigned to stand 2 instead of stand 1 with F.

1	2	3
F		D
E		
A	B	G

Q 10.

If A does not share a stand with D or G, then which of the following must be true?

(E) This temporary constraint means that there is a double possibility for A and G at stands 1 and 2. However, this tells you nothing about the game that you do not already know. Therefore, the question's constraint that E must share a group with

F is the correct answer.

Q 11.

If F shares a stand with A, then which of the following must be true?

(C) This constraint can happen only when F, E, and A all share stands 2. Remember that if they were assigned to stand 1, then A's sufficient necessary condition would force E to go to stand 2, which would be impossible with F assigned to stand 1. Therefore, since G cannot be assigned to stand 3, the only space for him is at stand 1.

Q 12.

If Iris and Habib are assigned to stand 1, then which of the following could NOT be true?

This constraint could occur in two scenarios, which you should draw out:

1	2	3
I	F	D
H	E	
✲A	B	C

1	2	3
I	A	D
H	C	F
B ✲A	G ✲B	E C

(B) B cannot be assigned to stand 2, because that would force G and C to be assigned to stand 1, thereby overcrowding it.

Hint for Explanation Question 13 to 18

1.	**Transcribe the Constraints** 1. Grouping: C ≠ G 2. Grouping: E ≠ D 3. Grouping: F ≠ C 4. Grouping: A ≠ B 5. Grouping: G ≠ F Notice that constraints 1, 3, and 5 can be consolidated: C ≠ G ≠ F

	This consolidated constraint demonstrates that none of these variables can be at the same table: 1 2 3 F/C/G G/F/C C/G/F ___ ___ ___ ___
2.	**Draw a Diagram.** *Write out the vacancy occupancy rules.* Based on the triple possibility that you have drawn above, you can write in two double possibilities: 1 2 3 F/C/G G/F/C C/G/F E/D D/E A/B B/A *Is there a burdensome constraint?* The triple possibility constrains the game so far that you know where every variable in the game can go.
3.	**Make a Hierarchy of Consolidated Constraints.** This is not necessary, since all of the variables are included in the game.

Q 13.

Which of the following is a list of people who could sit together at table 2?

(B) Notice that the same people could sit at table 2 as could sit at table 1.

(A) F and C cannot be in the same group.

(C) C and G cannot be in the same group.

(D) E and D cannot be in the same group.

(E) B and A cannot be in the same a group.

Q 14.

If F sits at table 3 and D sits at table 2, then which of the following pairs could share a table?

(D) D sitting at table 2 makes E sit at table 1. B and G could share a table.

Q 15.

If C cannot sit at a table with E or A, then which of the following must NOT be true?

(C) A and B cannot sit at the same table, so they must sit at tables 1 and 2. This makes C sit at table 3. Since table 3 holds only one person, F cannot sit at table 3.

Q 16.

If C shares a table with E and G shares a table with A, then which of the following could be true?

(A) Here is a possibility for this scenario. Notice that the people sitting at table 1 could also sit at table 2, yielding two possibilities for this configuration of variables:

1	2	3
C	G	F
B	A	
E	D	

(B) G and C cannot share a table with the same person.

(C) F must sit at table 3.

(D) Table 3 has room for only one person.

(E) C cannot share a table with both E and D.

Q 17.

If A does not share a table with D or G, then which of the following could NOT be true?

You cannot determine whether these people sit at table 1 or 2, so you should just draw out one scenario and be aware that tables 1 and 2 are interchangeable.

1	2	3
F/C	G/F/C	C/G/F
A	B	
E	D	

(D) You can see that G cannot share a table with E.

Q 18.

How many different people could potentially sit at table 3?

(A) Only three people, C, G, or F, could sit at table 3.

QUANTITATIVE REASONING

PERCENTAGE

"Per cent" means for every hundred. If you get 25 marks in an exam, where the full marks is 50, your percentage marks will be what you will get in hundred marks. (25/50 × 100)

Using unitary method: In 50 you get 25; so in 1 you get 25/50 and in 100 you get 25/50 × 100 = 50 percent. Thus, what you get out of hundred becomes the percentage

For a fraction, if the denominator is hundred, it is called a percentage and the numerator of the fraction is called rate percent

Percentage for Comparison:

Percentage helps us to compare between different fractions when the denominator or the total number is different in each case. It is one of the simplest tools for the comparison of data.

Take, for example, this table below, which shows the marks obtained by a student in 3 different subjects

Subject	Marks Obtained
History	60
Math	25
English	45

From this data above we cannot compare the marks obtained for various subjects. Now suppose we have the data of the total marks obtained as follows

Subject	Marks Obtained	Total Marks	Marks Obtained/total marks * 100
History	60	100	60%
Math	25	25	100%
English	45	90	50%

Now as all the three subjects are represented on a scale of 100, it is easy to compare the marks for the three subjects and decide which subject has the student scored the maximum in.

Presentations of Percentages

1) a% of b

a% of b (a percent of b) = b% of a

a% of b is represented mathematically as = $\frac{a}{100} \times b$

Example

24% of 25 = $\frac{24}{100} \times 25 = 6$

25% of 24 = = $\frac{25}{100} \times 24 = 6$

2) What percentage of a is b

This is represented as = $\frac{b}{a} \times 100$

Example

What percentage of 75 is 25?

Solution

= $\frac{25}{75} \times 100 = 33.33\%$

Points to Remember

1) To convert a fraction into a percentage

Multiply and divide by 100.

Keep the denominator as 100, the numerator you obtain is the required answer.

Take for example

= $\frac{21}{22}$

= $\frac{21}{22} \times \frac{100}{100}$

= $(\frac{21}{22} \times 100) \times \frac{1}{100}$

$= (\frac{21}{22} \times 100)\%$

$= 95\frac{6}{11}\%$

2) To find the fraction equivalent of a percentage

Divide by 100 (after removing the percentage sign)

$\frac{3}{8}\% = \frac{3}{8} \times 100$

$= \frac{3}{800}$

$25\% = \frac{25}{100} = \frac{1}{4}$

Question

Recently I went to buy a laptop for myself. The dealer said that he has laptops of two companies: HP and Lenovo. He was selling the HP laptop for Rs. 42000 and told me that he will offer me the same at 7/8 of that price while the Lenovo laptop was for Rs. 46000 and he were offering it at 4/5 th of that price. I decided to buy the laptop on which I was getting a better percentage discount. Which one should I buy?

Solution

HP: 7/8 means $\frac{7}{8} \times 100 = 87.5\%$ means a discount of $100 - 87.5 = 12.5\%$

LENOVO: 4/5 means $\frac{4}{5} \times 100 = 80\%$ means a discount of $100 - 80 = 20\%$.

Therefore, I should buy the LENOVO laptop.

The Concept Of Change

There are two types of change.

1. Absolute value change

It is the actual change in the quantity. For example, if there are 10 rabbits in the first year and 15 rabbits in the second year, the absolute change in the number of rabbits is 5

2. Percentage change

This can be obtained by calculating the absolute change and dividing it by the initial number. Percentage change = $\frac{Absolute\ value\ change}{Original\ quantity} \times 100$

Consider the above example of rabbits.

Percentage change = $\frac{5}{10} \times 100 = 50\%$

Percentage Change and Percentage Point Change

If the pass percentage of a class was 75% in 1991 and 85% in 1992, we can calculate the percentage point change and the percentage change as follows:

Percentage point change = Final percentage – Initial percentage

$= 85\% - 75\% = 10\%$

Percentage points Percentage change = $\frac{Final\ percentage - Initial\ percentage}{Initial\ percentage} \times 100$

$= \frac{85-75}{75} \times 100$.

$\frac{40}{3}\%$

To Increase A Number by A Given Percent

Use the formula: $\frac{100 + rate}{100}$

Example

Increase 40 by 20%

$\frac{100 + 20}{100} \times 40 = 48$

It is easier to remember that given the base value = x, the final value after increase can be found as:
20% increase = (x + 0.2x = 1.2x)
30% increase = (x + 0.3x = 1.3x)
5% increase= (x + 0.05x = 1.05x)

To Decrease a Number by a Given Number

Use the formula: $\frac{100-rate}{100}$

Example

Decrease 40 by 20%
$\frac{100-20}{100} \times 40 = 32$

It is easier to remember that given the base value = x, the final value after decrease can be found as:
20% decrease = 0.8 (0.8 = 1 - 0.2)
30% decrease = 0.7 (0.7= 1 - 0.3)
5% decrease = 0.95 (0.95= 1 - 0.05)

To find the percentage increase or decrease of a given number, the concept of percentage change is used as explained above.

Percentage Increase = $\frac{\textit{Final Value - Initial Value}}{\textit{Initial Value}} \times 100$

Percentage Decrease = $\frac{\textit{Initial Value - Final Value}}{\textit{Initial Value}} \times 100$

Basic Formulae related to Percentage Change:

If the price of a commodity increases by r%, then the reduction in consumption so as to not increase the expenditure is $\frac{r}{(100+r)} \times 100$. This formula can also be used to compare incomes between two people.

Example

If P's income is r% more than Q's income, then Q's income is less than P's income by $\frac{r}{(100+r)} \times 100$.
If the price of a commodity decreases by r%, then the increase in consumption so as to not decrease the expenditure is $\frac{r}{(100-r)} \times 100$.
This formula can also be used to compare incomes between two people.

Example

If P's income is r% less than Q's income, then Q's income is greater than P's income by $\frac{r}{(100-r)} \times 100$.

If there is a consecutive percentage change of a% and b%, the net change can be calculate as
Net change = $a + b + \frac{ab}{100}$

Example

Aqib is taking an examination, which has two sections A and B. He starts with section A and when he proceeds to section B he realizes that the marks carried for each question has decreased by 40% as compared to section A. How many more questions (in percentage) should he solve in section B as compared to section A if he wants to score same marks in section A and section B?

Solution

Here marks per question decreases by 40%, so using the formula, he should solve $\frac{40}{(100-40)} \times 100 = 66.66$ more questions in section B if he wants to score same marks.

Example

The petrol prices shot up by 20%. Amir travels 2000 km every month and his car gives a mileage of 20 km per liter. By how many kilometers should he reduce his travel to maintain his expenditure to the previous level?

Solution

At 20 km per liter he bought 2000/20 = 100 liters of petrol. Now the price the increased by 20%; the consumption has to be reduced by $\frac{20}{(100+20)} \times 100 = 16.66\%$.

Therefore, he should reduce his travel by $\frac{16.66 \times 2000}{100} = 333.33$ km to maintain the same expenditure level.

Example

After receiving two successive pay hikes if Asfand Yar's salary becomes 15/8 of his initial salary. By how much percent was the salary raised the first time if the second raise was twice as high (in %) as the first?

a) 15 %
b) 20%
c) 25%
d) 30%

Solution

Suppose first raise was of a % then the second raise = 2a %.

Net change = $a + 2a + \frac{2a \times a}{100}$

Now if initial salary was x, then % change = $\left(\frac{15x}{8} - x\right) \times 100x = \frac{700}{8}$

So $3a + \frac{2a^2}{100} = \frac{700}{8}$

= 25% Therefore, the first raise was of 25%.

Topic Drill

1. A's salary is 50% more than B's. How much percent is B's salary less than A's?
   A. $33\frac{1}{4}\%$ B. $33\frac{1}{3}\%$
   C. $33\frac{1}{2}\%$ D. 33%

2. The price of cooking oil has increased by 25%. By what percent should a family reduce the consumption of cooking oil so as not to increase the expenditure in this account?
   A. 20% B. 25%
   C. 18% D. 16%

3. Raheem's salary was reduced by 10% and then the reduced salary was increased by 10%. What was his net loss?
   A. 0% B. 10%
   C. 1% D. 5%

4. In a country 55% population is female. 80% of the male population is literate. How much of females are literate if total literacy is 58%?
   A. 45% B. 55%
   C. 40% D. 22%

5. Two numbers are less than a third number by 30% and 37% respectively. How much percent is the second number less than the first?
   A. 7% B. 10%
   C. 4% D. 3%

6. 40% of greater number is equal to 60% of the smaller. If their sum is 150, then the greater number is
   A. 70 B. 80
   C. 90 D. 60

7. If X% of Y is 100 and Y% of Z is 200, find a relation between X and Z.
   A. Z = X/2 B. Z = 2X
   C. X = Z/4 D. Z = 4X

8. If 20% of an electricity bill is deducted, then Rs. 100 is still to be paid. How much was the original bill?
   A. Rs. 110 B. Rs. 115
   C. Rs. 120 D. Rs. 125

9. 5% of 5% of Rs. 100 is
   A. Rs. 0.25 B. Rs. 0.50
   C. Rs. 10 D. Rs. 25

10. A town has population of 50,000 in 1988. In one year i.e. by 1989 it increased by

25%. Next year i.e in 1990, it decreased by 30%. The next year in 1991 there was an increase of 40% What is the population at end of 1991?

A. 60250 B. 62250
C. 66550 D. 61250

SOLUTION:

Q1.

Let salary of B be Rs.100

So salary of A - 150% of Rs.100 Rs.150

Now, how much percent is B's les A's?

$\frac{A's\ salary - B'sSsalary}{A's\ salary} \times 100 = \frac{50}{150} \times 100 = 33\frac{1}{3}\ \%$

Q2.

Expenditure = price × consumption
New price (P2) is 25% more than original (P1) = 125% of P1
Let consumption reduce to A% of initial consumption C
Since expenditure is same,
Initial price × consumption = final price × consumption

P1 × C = P2 × A% of C

$P1 \times C = \frac{125}{100} P1 \times \frac{A}{100} C$

Consumption should become 80% i.e., reduce by (100 – 80) = 20%

Q3.

Explanation:

Let, initial salary be Rs.100

Now salary was reduced by 10% **salary becomes** (100-10) = 90% of 100

Salary = Rs. 90

Now salary was increased by 10% **salary becomes** (100 + 10) = 110% of 90

Salary = Rs. 99

Loss % = $\frac{loss}{initial\ salary} \times 100 = \frac{1}{100} \times 100 =$ **1%**

Q4.

Explanation:

In such cases it is very easy to solve by taking total population = 100

So females = 55% Of 100 = 55 and males = 100 – 55 = 45
Now, literate population = 58% of 100 = 58 people
Male literate population = 80% of 45 = 36 people
Also, Female literates + Male literates = Total literates
Female literates = 58 -36 = 22 females are literates
Now how much percent is 22 of 55?
Female literates in % = $\frac{22}{55} \times 100 = 40\%$

Q5.

Let the 3rd number be 100.

So, 1st number is 30%less than 100=(100 – 30) % of 100 = 70

Also, 2nd number is 37% less than 100 = (100 – 37)% Of 100 = 63

Now, how to find how much percent is 2nd number less than 1st?

%less = $\frac{70-63}{70} \times 100 = \frac{7}{70} \times 100 = 10\%$

Q6.

Sum is 150 so 70 and 60 cannot be greater number as 150 – 70 =80
Which is greater than 70. Same for 150 – 60 = 90
So answer can be option b (80) or option c (90)

Consider 80 first so smaller number will be (150 – 80) = 70

40% of 80 = $\frac{40}{100} \times 80 = 32$

60% of 70 = $\frac{60}{100} \times 70 = 42$

32 ≠ 42 so 80 is not the answer

So answer is option C = 90

Q7.

As per given conditions,

$\frac{x}{100} \times Y = 100 \quad = Y = \frac{100 \times 100}{x}$

Also, $\frac{Y}{100} \times z = 200$

$= \frac{100 \times 100 \times Z}{x \times 100} = 200$

$Z = 2x$

Q8.

After 20% bill has been deducted, we still have to pay Rs. 100

So remaining (100 – 20) = 80% bill = Rs. 100

$\frac{80}{100} \times Bill = 100$

Bill = Rs. 125

Q9.

5 % of 5% of Rs. 100 = $\frac{5}{100}$ $(\frac{5}{100} \times 100)$ = Rs. 0.25

Q10.

Explanation:

Remember this formula. It is similar to formula for compound interest.

Population after n years = $P(1 \pm \frac{R}{100})^n$

P = present population; R = Rate of increase of decrease; n = number of years;

'+' = during increase; '-'during decrease

Using formula given above

Rate 1 = R 1 = 25% (increase);

Rate 2 = R 2 = 30% (decrease)

Rate 3 = R 3 = 40% (increase)

Population after 3 years = $50,000(1 + \frac{25}{100})$ $(1 - \frac{30}{100})$ $(1 + \frac{40}{100})$

$= 50,000(\frac{125}{100})$ $(\frac{70}{100})$ $(\frac{140}{100}) = 61.250$

PROFIT AND LOSS

Profit and loss is an important topic of Quantitative Aptitude section. These formulas and shortcuts will be helpful for the solution of the questions.

Cost Price

Cost Price is the price at which an article is purchased, abbreviated as CP.

Seiling Price

Selling Price is the price at which an article is sold, abbreviated as SP

Profit

If the Selling Price exceeds the Cost Price, then there is Profit.

Profit or gain = SP – CP

$\text{Profit \%} = \frac{Profit}{Cost\ Price} \times 100$

$SP = \frac{100 + gain\ Percent}{100} \times CP$

$CP = \frac{100}{100 + gain\ percent} \times SP$

Loss

If the overall Cost Price exceeds the selling price of the buyer then he is said to have incurred loss.

Loss = CP – SP

$\text{Loss \%} = \frac{loss}{Cost\ Price} \times 100$

$SP = \frac{100 - loss\ Percent}{100} \times CP$

$CP = \frac{100}{100 - loss\ percent} \times SP$

Profit and Loss Based on Cost Price

To find the percent gain or loss, divide the amount gained or lost by the cost price and multiply it by 100.

Example

A toy that cost 80 rupees is sold at a profit of 20 rupees. Find the percent or rate of profit.

Answer

$\frac{Gain}{Cost} \times 100 = Profit\ Percent$

$\frac{20}{80} \times 100 = 25\%$

To find the loss and the selling price when the cost and the percent loss are given, multiply the cost by the percent and subtract the product from the cost.

Example

A damaged chair that cost Rs.110 was sold at a loss of 10%. Find the loss and the selling price.

Answer

Cost × percent loss = loss
110 x 1/10 = 11, loss
Cost - loss = selling price.
110 - 11 = 99, selling price.

Profit and Loss_Based on Selling Price

To find the profit and the cost when the selling price and the percent profit are given, multiply the selling price by the percent profit and subtract the result from the selling price.

Example

A toy is sold for Rs. 6.00 at a profit of 25% of the selling price. Separate this selling price into cost and profit.

Answer

Selling price x % profit = profit.

Selling price = profit + cost.

6.00 x .25 = 1.50, profit.

6.00 - 1.50 = 4.50, cost.

To find the loss and the cost when the selling price and the percent loss are given, multiply the selling price by the percent loss and add the result from the selling price.

Example

At a sale, neckties selling at Rs. 50.00 are sold at a loss of 60% of selling price. What is the loss and the original cost?

Selling price × % loss = loss.
Selling price + loss = cost.
50.00 x .60 = 30.00, loss.
50.00 + 30.00 = 80.00, cost.

To find the selling price when the cost and the percent loss are given, add the percent loss to 100% and divide the cost by this sum.

Example

Socks that cost 7.00 per pair were sold at a loss of 25% of selling price. What was the selling price?

Answer

$\frac{Cost}{100 + \%\ Loss} = SP$

7.00 / 1.25 = 5.60, selling price.

To find the selling price when the profit and the percent profit are given, or to find the selling price when the loss and the percent loss are given, divide the profit or loss by the percent profit or loss.

Note

This rule should be compared with the one under Profit and Loss Based on Cost. The two rules are exactly similar except that in one case 100% represents cost while in the other case 100% represents selling price.

Example

A kind of tape is selling at a profit of 12% of selling price, equal to 18 per yard. What is the selling price of the tape?

Answer

$\frac{Profit}{\%\ Profit} = Sp$

18 /.12 = 150 selling price.

To find the percent profit or loss, divide the amount gained or lost by the selling price.

Example

A candy bar sells for Rs 130 at a profit of Rs 65. What percent of profit on selling price does this represent?

Answer

Gain / selling price = % profit.

65 / 1.30 = .5 or 50% profit.

Topic Drill

1. A person sold a stove for Rs. 423 and incurred a loss of 6%. At what price would it be sold to earn a profit of 8%?
   A. Rs. 525 B. Rs. 500
   C. Rs. 490 D. **Rs. 486**

2. A fruit seller buys 2 lemons for a rupee and sells 5 lemons for three rupees. His gain percent is
   A. 10% B. 15%
   C. 20% D. 25%

3. A sells a car to B at 10% loss. If B sells it for Rs. 54000 and gains 20%, the cost price of the car for A was
   A. Rs. 25000 B. Rs. 50000
   C. Rs. 37500 D. Rs. 60000

4. Rashid sold a statue for a price 25% higher than the original price of the statue. He had however bought the statue at 20% discount on the original price. With the profit of Rs. 2025, find the original price of the statue.
   A. Rs. 6000 B. Rs. 7500
   C. Rs. 3500 D. Rs. 4500

5. If selling price of 40 articles is equal to cost price of 50 articles, the loss or gain percent is
   A. 25% loss B. 20% loss
   C. 25% gain D. 20% gain

6. Two bicycles were sold for Rs. 3990 each, gaining 5% on one and losing 5% on the other. The gain or loss percent on the whole transaction is
   A. Neither gain nor loss
   B. 2.5% gain
   C. 2.5% loss
   D. 0.25% loss

7. The ratio of cost price and selling price is 4:5. The profit percent is
   A. 10% B. 20%
   C. 25% D. 30%

8. If a person sells a Jeans for Rs. 5200, making a profit of 30%, then the cost price of the Jeans is
   A. Rs. 4420 B. Rs. 4000
   C. Rs. 3900 D. Rs. 3800

9. A shopkeeper earns a profit of 15% after selling a book at 20% discount on the printed price. The ratio of the cost price and printed price of the book is
   A. 20:23 B. 23:20
   C. 16:23 D. 16: 23

10. Shakira bought pet food worth Rs. 56000. She then sold 1/3rd of it incurring a loss of 40%. What profit she must earn on rest of the supplies to nullify this loss10?
    A. 25% B. 20%
    C. 45% D. 50%

SOLUTIONS

Q1.

Answer = D

If loss is A% then Selling Price = (100 - A)% of cost price.

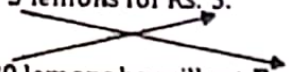
Selling Price = Rs. 423 = (100 -6)% of CP = $\frac{94\ CP}{100}$

Now profit should be 8%

Q2.

ANSWER: C

Seller buys 2 lemon for one rupee.
So how much can he buy in say Rs. 10
He will get 2 × 10 = 20 lemons in Rs 10 = cost price
He sells 5 lemons for Rs.3
Seller buys 2 lemons for one rupee.
So how much can he buy in say **Rs. 10**
He will get 2 x 10 = 20 lemons in **Rs. 10 = Cost price**
He sells 5 lemons for Rs. 3.



So for 20 lemons he will get Rs. ?

$\therefore ? = \frac{20 \times 5}{3} =$ **Rs. 12 = Selling Price**

Gain= SP-CP = 12-10 = Rs. 2

Gain percent $= \frac{\text{Gain}}{\text{Cost price}} \times 100 = \frac{2}{10} \times 100 = 20\%$

Q3.

ANSWER: B

B sells for profit of 20%
Tip: If gain is A%, then Selling prince – (100+A)% of cost price
Selling Price =Rs. 54000 = (100+20)% of CP = $\frac{120}{100} \times$ CP
CP for B = $54000 \times \frac{100}{120} = 54 \times 9 =$ Rs.45000 = SP for A
For there is loss of 10%
Tip: If loss is A% , then Selling price = (100 – A)% of cost price
Selling price for A = Rs.45000 = (100-10)% of CP = $\frac{90CP}{100}$
CP = Rs. $\frac{45000 \times 100}{90}$ =Rs.50000

Q4.

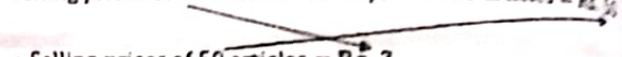
ANSWER: D

Let original price be P
Selling price = 25% more than original price = 125% of P
Discount is 20%, so, Cost price = (100-20) 80% of P
Profit = selling price – cost price
2025 = 125% of P – 8-% of P = 45% of P = $\frac{45}{100} \times P$
P= $\frac{2025 \times 100}{45}$ =Rs.4500 = Original Price

Q5.

ANSWER: C

Let cost price of 1 article be Re.1
So total **Cost price** = 50 x Re. 1 = **Rs. 50**
Selling prices of 40 articles = Cost price of 50 articles = Rs. ½



∴ Selling prices of 50 articles = **Rs. ?**

$\therefore ? = \frac{50 \times 50}{40} =$ **Rs. 62.5 = Selling Price of 50 articles**

SP>CP so gain

Gain% $= \frac{SP-CP}{CP} \times 100 = \frac{12.5}{50} \times 100 =$ **25% = Gain**

Q6.

ANSWER: D

Whenever a person has A% loss for one thing and A% profit for second thing, then if selling price is same, person will always have loss and
Loos = $\frac{A^2}{100}\%$
Loss = $\frac{5^2}{100}\% = 0.25\%$

Q7.

ANSWER: C

Cost 0price (CP) : selling price (SP) = 4:5 Let, SP = Rs.5; So, CP=Rs.4
Profit = SP = CP = 5-4 = Rs.1
Profit % = $\frac{Profit}{CP} \times 100 = \frac{1}{4} \times 100 = 25\%$

Q8.

ANSWER: B

If profit is A% = then selling price = (100 + A)% of cost price
Selling Price = (100+30) % of CP

$5200 = \frac{130}{100} \times CP$

CP=Rs.4000

Q9.

ANSWER: C

Profit and Discount is there,

So, Cost Price (CP)< Selling Price (SP) < Printed Price (PP)

This is true for ratio also, so, 23:20 and 23:16 is not

Possible as here CP>PP

Now first take 20:23

Let PP be 23.

20% discount means 20% of 23 = 4.6

SP = 23 – 4.6 = 18.4

SP<CP

Since profit is there SP should be > CP

Therefore, answer is 16:23

Q10.

ANSWER: B

Nullify the loss means at the end there is no profit no loss.

To nullify loss of 40% in 1 part, we need profit of 40% from 2 parts

There are 3 parts –

1	2	3
Loss 40%	Profit 40%	Profit 40%

However, this will give 40% + 40% = 80% profit.

We only need 40%

Since there are 2 parts, simply divide the required profit % by 2

Required profit % = $\frac{40}{2}$ = 20%

INTEREST

Simple and Co mpound Inter est is an important segment of the Arithmetic section under Quantitative Aptitude.

Simple Interest (SI) = $\frac{P \times R \times T}{100}$

Amount: Amount is total sum of Principal and simple Interest.

where P = principal,

R(%) = rate of interest per annum,()

T = time period (in years)

So, $P = \frac{SI \times 100}{R \times T}$; $R = \frac{SI \times 100}{P \times T}$; $T = \frac{SI \times 100}{P \times R}$

Example

If the principal is Rs. 100. The difference of Simple Interest for 4yrs and 6yrs is Rs 8. Calculate the rate of simple interest.

Solution

In simple interest questions, interest always remains same for a year if the principal, rate of interest is constant for the same.

Let Interest for 4 years is I then interest for 6 years is (I+8)

interest for 2 years is Rs. 8

interest for 1 year = 4

rate of interest = (4/100) × 100 = 4%

Example

If the amount is (10/9) times of Principal and rate of interest and time both are numerically equal. Then, what is the rate of interest per annum?

Solution

Let Principal is P. Given, numerically R = T

Interest = Amount – principal

$I = (10/9)P - P$

I = P/9 (Interest is in the multiples of Principal)

Now, $I = [(P \times R \times T)/100]$

$P/9 = (P \times R \times T)/100$

$R^2 = 100/9$ (using, R=T)

R = (10/3)%

We can also say the time period is (10/3)years.

Example

A sum of money doubles itself in 3 years at a simple interest. In how many years will it amount to 8 times itself?

Solution

Doubles in 3 years
3 times in 3× 2 = 6yrs
4 times in 3× 3 = 9yrs
8 times in 3× 7 = 21yrs

Topic Drill

1. Saleem borrowed some money from his friend at simple interest of 6% per annum. He returned his friend Rs. 15600. After how much time did Sam return the money if he borrowed Rs. 12000?
   A. 8 years B. 2.5 years
   C. 5 years D. 3.5 years

2. Kabir paid Rs. 9600 as interest on a loan he took 5 years ago at 16% rate of simple interest. What was the amount he took as loan?
   A. Rs. 16400 B. Rs. 12000
   C. Rs. 12500 D. Rs. 18000

3. Shaukat for 2 years invested Rs. 500 in MCB. He also invested Rs. 300 in NIT for 4 years. At the end, he received Rs. 220 from both banks as simple interest. What must have been rate of interest?
   A. 10% B. 12%
   C. 11% D. 5.5%

4. Ramzan paid Rs. 11400 as interest after 9 years. He had borrowed some money at rate of 6% for first two years, 9% for next three years and 14% for rest of the period. How much money did he borrow?
   A. Rs. 10000 B. Rs. 15000
   C. Rs. 12000 D. Rs. 12500

5. Raheem gets Rs. 2600 for Rs. 2000 in 5 years at some rate of simple interest. Had he invested in other places where rate of simple interest is 3% more than current rate, how much would have Raheem got in same time?
   A. Rs. 2900 B. Rs. 3000
   C. Rs. 3100 D. Rs. 2800

6. Guddi invested some money in a bank at rate of 6% per annum. At simple interest, after 9 years, she got Rs. 8470. How much did she invest?
   A. Rs. 5250 B. Rs. 6550
   C. Rs. 6400 D. Rs. 5500

7. Aman got a salary of Rs. 8600. He invested the salary in two parts. Find the difference between the two parts of his salary, if in first part he got some simple interest at 15% per annum in 4 years, which was same as the second part, which he invested at 20% for 3 years.
   A. Rs. 0 B. Rs. 2400
   C. Rs. 100 D. Rs. 4500

8. Asim invests Rs. 8000 at some rate of interest. Being simple interest, the money doubles in 5 years. Raju sees this and invests Rs. 6250 for 3 years at same rate of interest. How much interest does Raju get?
   A. Rs. 3750 B. Rs. 6250
   C. Rs. 3125 D. Rs. 4250

9. If simple interest for 2 years for a sum is Rs. 600 and compound interest for the same sum for 2 years and same rate of interest is Rs. 645, what will be the rate of interest?
   A. 10% B. 15%
   C. 30% D. 5%

10. In 4 years the simple interest on certain sum of money is 9/25 of the principal. The annual rate of interest is
    A. 4% B. 4(1/2)%
    C. 9% D. 10%

SOLUTIONS

Q1.

ANSWER: C

Amount = Principle + simple Interest

Simple Interest = 15600 – 12000 = Rs.3600

Simple Interest = $\frac{PRT}{100}$

Where P = Principal, R = Rate of interest and T = time period

$3600 = \frac{12000 \times T}{100}$

T = 5 years

Q2.

ANSWER: B

Simple Interest = $\frac{PRT}{100}$

Where P = Principal

R= rate of interest

T= time period

$9600 = \frac{P \times 16 \times 5}{100}$

P = Rs.12000

Q3.

ANSWER: A

Simple interest = SI = $\frac{PRT}{100}$

Where P = Principal, R= rate of interest, T= time period

Total SI = SI form MCB and SI from NIT

$220 = \frac{500 \times R \times 2}{100} + \frac{300 \times R \times 4}{100}$

220 = 10R + 12R

R = 10% = Rate of Interest

Q4.

ANSWER: C

Here, principal amount is same but rate of interest is different for

Different times.

Therefore, simple interest would also be different

Simple interest = $\frac{PRT}{100}$

Where P = Principal, R= rate of interest, T= time period

Time periods are 2 years, 3 years and (9-2-3) = 4 years

$11400 = \frac{P \times 6 \times 2}{100} + \frac{P \times 9 \times 3}{100} + \frac{P \times 14 \times 4}{100}$

P = Rs.12000

Q5.

ANSWER: A

Amount = Principal + simple Interest

Simple interest in first case = 2600 -2000 = Rs. 600

Also, Simple interest = $\frac{PRT}{100}$

Where P = Principal, R= rate of interest, T= time period

$600 = \frac{2000 \times R \times 5}{100}$

R = 6%

Now in second case, Rs = 6+3=9%

Amount = Principal + Simple Interest

Amount $2000 + \frac{2000 \times 9 \times 5}{100}$ = Rs.2900

Q6.

ANSWER: D

Amount = Principal + Simple Interest

Simple Interest = SI = $\frac{PRT}{100}$

Where P = Principal, R= rate of interest, T= time period

$8470 = P + \frac{P \times 6 \times 9}{100}$

$= 8470 \times 100 = 154P$

P = Rs.5500 = Amount invested by Guddi

Q7.

ANSWER: A

Let, one part of salary be Rs. M, and then other part is Rs. (8600 - M)

We know that simple interest is same

Simple Interest = SI = $\frac{PRT}{100}$

Where P = Principal, R= rate of interest, T= time period

$\frac{M \times 15 \times 4}{100} = \frac{(8600-M) \times 20 \times 3}{100}$

M = Rs. 4300 = one part of salary

Second part = 8600-4300=Rs.4300

Difference between parts = 4300-4300 = Rs.0

Q8.

ANSWER: A

The money doubles,

Simple interest after 5 years = principle = Rs. 8000

Simple Interest = SI = $\frac{PRT}{100}$

Where P = Principal, R= rate of interest, T= time period

$8000 = \frac{8000 \times R \times 5}{100}$

R = 20%

Now, Raju will get,

SI = $\frac{6250 \times 20 \times 3}{100}$ = Rs.3750

Q9.

ANSWER: B

Simple interest for 2 years = Rs.600

So 1st year simple interest Rs. 300

And 2nd year simple interest = Rs.300

In compound interest, interest is given on the sum as well as the previous interest

Compound interest is Rs.45 (Rs.645 – Rs. 600) more than simple interest for 2 years

This means the extra Rs. 45 is simple interest given on the 2nd year simple interest

i.e. Rs. 300

Simple Interest = SI = $\frac{PRT}{100}$

Where P = Principal, R= rate of interest, T= time period

$45 = \frac{300 \times R \times 1}{100}$

R = 15%

Q10.

ANSWER: C

Tip: Simple Interest = SI = $\frac{PRT}{100}$

Where P = Principal, R= rate of interest, T= time period

Here, simple interest SI = $\frac{9}{25}$ of principal =

$\frac{9}{25}P = \frac{P \times R \times 4}{100}$

R=9%

VERBAL REASONING

SYNONYMS

Synonyms are words which have the same or nearly the same meaning as another word. For instance, 'affluent' and 'opulent' are synonyms because they mean the same, that is, 'rich'. Generally speaking, knowledge of synonyms of words and general vocabulary is of utmost importance. These become doubly important in examinations where these often appear as questions.

1. Before the examination, you must make sure that you attempt to improve your vocabulary through reading. You may read novels, the newspaper or any other English literature media especially the Classics. Most nationally circulated newspapers contain articles written in a decent level of language. This helps by letting you build context surrounding the words. When you see the word being used in a sentence, you form a background on the word, making it easier to guess its synonym.

2. Every time you come across a new word, you must look it up in the dictionary and thesaurus to make sure that word is well-understood and thus, well-memorized. You can even make sentences of your own or use mnemonics to remember the word.

3. Another way to guess the meaning of the word is through breaking down the word into its roots. For instance, 'Ornithology' may be split into 'ornis' which means 'birds' and 'logos' which means 'study' thus establishing that it is the study of birds.

4. You can maintain a diary or notebook to keep a record of all the new words. This notebook will then serve as a tool for quick revision as the examination day nears.

5. You may prefer learning words of a similar category together for better understanding. For example, the names of specialists maybe learnt together. For instance, cardiologist (heart specialist), neurologist (brain specialist) and ophthalmologist (eye specialist)

6. Practicing a lot of exercises on synonyms and words with similar meanings can be advantageous. The more you rehearse, the better you become.

7. During the examination, you must carefully examine each option before choosing the correct one. If you are stuck, using the word in a sentence and then doing the same with each of the options may help bring some clarity.

8. Synonyms when used in the same sentence at the same place, ideally do not change the entire meaning of the sentence. For example, "It was Sahil's *hesitation* that was the cause of all trouble" can be replaced by "It was Sahil's *reluctance* that was the cause of all trouble" as 'hesitation' and 'reluctance' are similar in meaning.

9. In case you are unable to choose between two given options, it is preferable to choose the word which

matches the degree of the word in question. For instance, the word 'obese' would be most similar in meaning to 'overweight' rather than just 'plump'.

10. Keep an eye out for easily confusable words and homophones. These are words that sound alike but may be spelled differently. For instance, 'bare' and 'bear'. These cannot be used interchangeably. Try remembering the context in which you read the word first. This will help clear any confusion.

Topic Drill

1. Vicissitude
   A. sorrows B. misfortunes
   C. changes D. surprises
2. Pandemonium
   A. great joy B. utter confusion
   C. loud noise D. big crowD.
3. Garrulity
   A. credulity B. speciousness
   C. Loquaciousness D. speciousness
4. Magniloquent
   A. Amusing B. Humorous
   C. Intelligent D. Boastful
5. Yokel
   A. Intrigue B. Simple-minded
   C. Victorious D. Noise
6. Vindicate
   A. Argue B. Destroy
   C. Acquit D. Identify
7. Abeyance
   A. Suspension B. Persistence
   C. Continuation D. RigiD.
8. Aesthetic
   A. Mediocre B. Prevalent
   C. Ugly D. Beautiful
9. Imbecile
   A. Sane B. Astute
   C. Foolish D. AiD.
10. Epitome
    A. Precise B. Summary
    C. Spurn D. Exemplar
11. Calumny
    A. Libel B. Vindication
    C. Dissent D. Commendation
12. Chimera
    A. Chimney B. Protest
    C. Illusion D. Panache
13. Placate
    A. Pity B. Embroil
    C. Appease D. Amuse
14. Dissolute
    A. Distant B. Repulsive
    C. Honest D. Immoral
15. Abridge
    A. Abort B. Span
    C. Shorten D. Cross
16. Gregarious
    A. Social B. Shag
    C. Single D. BlenD.
17. Shabby
    A. Peerless B. Sublime
    C. Petty D. Important
18. Censure
    A. Strike B. Criticize
    C. Write D. Believe
19. Virulent
    A. Defunct B. Deadly
    C. Daring D. Deceptive
20. Defunct
    A. Inoperative B. Demand
    C. Supply D. Anticipate
21. Misprize

A. Despise
B. Traduce
C. Erroneous
D. Diminish

22. Insolent
A. Disrespectful
B. Sole of A Shoe
C. Insoluble
D. Depreciating

23. Imperial
A. Bratty
B. Oppressive
C. Regal
D. Wonderful

24. Deluge
A. Confusion
B. Deception
C. FlooD.
D. Weapon

25. Stringent
A. Shrink
B. Stringy
C. Rigorous
D. Tense

26. Parochial
A. Reluctant
B. Narrow-Minded
C. Troublesome
D. Gloomy

27. Vestige
A. Invention
B. Example
C. Evidence
D. Experiment

28. Majestic
A. Attractive
B. Extraordinary
C. GranD.
D. Interesting

29. Unfeigned
A. Sincerely
B. Insincere
C. Untrustworthy
D. Tricky

30. Perspicuous
A. Cruel
B. Cleaver
C. Dim
D. Clear

SOLUTIONS:

Q 1.
Meaning: A change of circumstances, typically one that is unwelcome or unpleasant.
Synonyms: Alteration, Change, Transition
Antonyms: Stagnation, Uniformity, Stability

Q 2.
Meaning: It is a state of noisy, confused activity.
Synonyms: Alarums, Blather, Clatter
Antonyms: Calm, Hush, Quiet

Q 3.
Meaning: The use of too many words to express an idea.
Synonyms: Circumlocution, Diffuseness, Verbiage
Antonyms: Brevity, Briefness, Terseness

Q 4.
Meaning: Magniloquent is using high-flown or bombastic language.
Synonyms: Grandiloquent, High-sounding, Lofty
Antonyms: Terse, Crisp

Q 5.
Meaning: Yokel is an uneducated or simple-minded person from countryside.
Synonyms: Bumpkin, Rustic, Hillbilly
Antonyms: Cosmopolitan, Sophisticate

Q 6.
Meaning: To vindicate is to free from a charge of wrongdoing.
Synonyms: Acquit, Clear, Exonerate
Antonyms: Criminate, Incriminate, Accuse

Q 7.
Meaning: *Abeyance* is a temporary stop to something or a pause.
Example: Due to budget cuts, employer

contributions to retirement accounts are being put in abeyance.

Synonyms: Discontinuation, Dormancy, Inactivity, intermission

Antonyms: Continuation, Action, Activity, Operation

Q 8.

Answer: Beautiful

Meaning: *Aesthetic* means the pleasant, positive or artful appearance of a person or a thing.

Example: You should now focus on the aesthetic factors of your art collection.

Synonyms: Artistic, Creative, Artful, Gorgeous

Antonyms: Displeasing, Ugly, Unattractive

Q 9.

Answer: Imbecile

Meaning: An *imbecile* is foolish or is not very smart.

Example: He convinced the police officer not to arrest the drunken imbecile.

Synonyms: Simple, Stupid, Thick, Dull

Antonyms: Intelligent, Smart, Brainy

Q 10.

ANSWER: Exemplar

Meaning: Epitome is defined as a person or object that is defined as a perfect example of something.

Example: The hotel is epitome of grandeur and elegance.

Synonyms: Perfect Example, Exemplar, Embodiment, Apotheosis

Antonyms: Addition, Enlargement, Expansion, Extension

Q 11.

ANSWER: Libel

Meaning: Calumny is the making of false statements that damage another's reputation.

Example: That blog is just a forum for calumny and rumors.

Synonyms: Slander, Defamation, Lie, Libel

Antonyms: Acclaim, Accolade, Adoration, Commendation

Q 12.

ANSWER: Illusion

Meaning: It refers to an impossible or foolish fancy.

Chimera is a fire-breathing female monster in Greek myths with the head of a lion, the body of a goat, and the tail of a serpent.

Example: My little girl believes unicorns are real and not a chimera.

Synonyms: Dream, Fantasy, Delusion, Fancy

Antonyms: Fact, Certainty, Reality, Truth

Q 13.

ANSWER: Appease

Meaning: Placate is defined as to soothe someone who is angry or upset.

Example: I do not need you to placate me.

Synonyms: Satisfy, Appease, Mollify, Pacify, Soothe

Antonyms: Agitate, Incite, Irritate, Provoke

Q 14.

ANSWER: Immoral

Meaning: Dissolute is immoral and involved in improper conduct

Example: You must stay away from that dissolute boy.

Synonyms: Corrupt, Degenerate, Indulgent,

Antonyms: Chaste, Moral, Good, Resolute, Virtuous

Q 15.

ANSWER: Shorten

Meaning: Abridge means to reduce or condense the size or scope.

Example: Abridged version of this text is available on Careerride.com.

Synonyms: Shorten, Truncate, Curtail, Abbreviate

Antonyms: Expand, Extend, Increase, Lengthen

Q 16.

ANSWER: Social

Meaning: The meaning of gregarious is people or animals that are very social and enjoy being in crowds.

Someone who is outgoing, sociable, and fond of the company of others.

Example: This insect is gregarious and nocturnal

Synonyms: Friendly, Affable, Sociable, Cordial

Antonyms: Unfriendly, Cold, Introverted, Unsociable

Q 17.

ANSWER: Petty

Meaning: Shabby describes something that is threadbare or worn out.

It also means unfair or low quality.

Example: A shirt with holes and stains can be said as shabby shirt.

Synonyms: Crummy, Desolate, Scruffy, Tacky, Broken-down

Antonyms: Clean, Fresh, Good, Happy, New

Q 18.

ANSWER: Criticize

Meaning: Censure is a strong judgment of disapproval or criticize in a harsh manner.

Example: They were brought under official censure and forbidden to re-open the company.

Synonyms: Rebuke, Reprimand, Condemnation, Admonition

Antonyms: Praise, Acceptance, Agreement, Approval, Compliment

Q 19.

ANSWER: Deadly

Meaning: Virulent is something very dangerous or harmful. It also is being especially bitter, ardent and hostile.

Example: The virulent infection took her life.

Synonyms: Deadly, Poisonous, Fatal, Malignant, Pernicious

Antonyms: Harmless, Helpful, Wholesome, Healthy

Q 20.

ANSWER: Inoperative

Meaning: Defunct describes something that used to exist, but is now gone.

Defunct is a person or thing that no longer lives or exists.

Example: Dinosaurs are now defunct.

Synonyms: Obsolete, Vanished, Nonexistent, Dead

Antonyms: Alive, Existent, Functioning, Operative

Q 21.

ANSWER: Despise

Meaning: It means to despise or detract or undervalue.

Example: You must not make the mistake of misprizing his idea.

Synonyms: Detest, Disdain, Hate, undervalue

Antonyms: Accept, Admire, Approve, Cherish

Q 22.

ANSWER: Disrespectful

Meaning: Insolent is someone who displays rude boldness or disrespectful behavior.

Example: He was so violent and insolent that they had to fire him.

Synonyms: Arrogant, Brazen, Impolite, Discourteous

Antonyms: Cowardly, Modest, Polite, Respectful

Q 23.

ANSWER: Regal

Meaning: Imperial refers to large and impressive in size, grandeur, extent, or conception.

Example: The imperial city of Rome is one of the most beautiful in the World.

Synonyms: Royal, Stately, Domineering, Kingly, Majestic

Antonyms: Common, Humble, Unimpressive, Unheroic

Q 24.

ANSWER: Flood

Meaning: Deluge is a flood or a massive amount of something that all arrives at the same time.

Example: A deluge of visitors filled the library on Sunday.

Synonyms: Barrage, Flood, Torrent, Downpour, Flux

Antonyms: Drought, Drip, Trickle

Q 25.

ANSWER: Rigorous

Meaning: Stringent is something that is strict, precise and must be followed or listened to exactly.

It refers to something demanding strict attention to rules and procedure.

Example: Stringent safety measures are followed in the factory.

Synonyms: Rigid, Tight, Binding, Severe, Stiff

Antonyms: Easy, Facile, Flexible, Gentle, Lenient

Q 26.

ANSWER: Narrow-Minded

Meaning: Parochial is someone who has a narrow or simplistic view on life.

Example: Though he lives in Mumbai, his parochial outlook does not change.

Synonyms: Petty, Insular, Conservative, Narrow

Antonyms: Broad-minded, Broad, Liberal, Unrestricted

Q 27.

ANSWER: Evidence

Meaning: Vestige is a small amount of something or the last remaining part of something that no longer exists.
Example: All these dishes are endearing vestige of the golden era.
Synonyms: Relic, Residue, Evidence, Trace
Antonyms: Information, Lot

Q 28.

ANSWER: Grand
Meaning: It refers to something or someone having or displaying great dignity or nobility.
Example: The Eight Wonders of the World are majestic.
Synonyms: Awesome, Grand, Dignified, Elevated, Imperial
Antonyms: Low, humble, Lowly, Shabby

Q 29.

ANSWER: Sincerely
Meaning: Unfeigned is something genuine, sincere or not fake.
Example: The joy on her face was unfeigned.
Synonyms: Honest, Genuine, Real, Natural, Sincere
Antonyms: Pretended, Insincere

Q 30.

ANSWER: Clear
Meaning: Perspicuous means clear in statement or expression; easily understood; lucid
Example: Poetry should not be as perspicuous as prose.
Synonyms: Apparent, Clear-cut, Crystal, Distinct, Lucid
Antonyms: Unclear, Obscure, Vague

VOCABULARY

Following is a list of English words with meaning. You are advised to memorize all these words. All these words will be used in the Verbal section in the next module.

Word	Common Meaning
Abominable	very unpleasant; disagreeable
Affirmations	The action or process of affirming something.
Allegations	A claim or assertion that someone has done something illegal or wrong, typically one made without proof.
Altitudes	The height of an object or point in relation to sea level or ground level.
Anticipates	Regard as probable; expect or predict.
Applauded	Show approval or praise by clapping.
Auspicious	Conducive to success; favorable.
Austerity	Sternness or severity of manner or attitude.
Benchmarks	A standard or point of reference against which things may be compared.
Circumstantial	Pointing indirectly towards someone's guilt but not conclusively proving it.
Confluence	The junction of two rivers, especially rivers of approximately equal width.
Consciences	A person's moral sense of right and wrong
Constructed	Build or make (something, typically a building, road, or machine).
Contrapositive	A proposition or theorem formed by contradicting both the subject and predicate or both the hypothesis and conclusion of a given proposition or theorem and interchanging them. "if not-b then not-a " is the **contrapositive** of "if a then b "
Correlation	A mutual relationship or connection between two or more things.
Cryptic	Having a meaning that is mysterious or obscure.
Cynicism	An inclination to believe that people are motivated purely by self-interest
Deliberate	Done consciously and intentionally.

Determinative	Serving to define, qualify, or direct.
Discourtesy	Rude and inconsiderate behavior.
Disseminated	Spread (something, especially information) widely.
Embedded	Fix (an object) firmly and deeply in a surrounding mass.
Endangered	(of a species) seriously at risk of extinction.
Engendered	Cause or give rise to (a feeling, situation, or condition).
Excavation	The action of excavating something, especially an archaeological site.
Foresight	The ability to predict what will happen or be needed in the future.
Fortuitous	Happening by chance rather than intention.
Illustrates	Provide (a book, newspaper, etc.) With pictures.
Impedes	Delay or prevent (someone or something) by obstructing them; hinder.
Meretricious	Apparently attractive but having no real value.
Ominous	Giving the worrying impression that something bad is going to happen; threateningly inauspicious.
Outrageously	In a shockingly bad or excessive way.
Perimeter	The continuous line forming the boundary of a closed geometrical figure.
Praiseworthy	Deserving approval and admiration.
Precursor	A person or thing that comes before another of the same kind; a forerunner.
Proclamation	A public or official announcement dealing with a matter of great importance.
Proliferation	Rapid increase in the number or amount of something.
Reciprocal	Given, felt, or done in return.
Reluctance	Unwillingness or disinclination to do something.
Retrospect	A survey or review of a past course of events or period of time. "a full retrospect of the battle"
Rumblings	A continuous deep, resonant sound.

Skeptics	A person inclined to question or doubt accepted opinions.
Steadfastness	2. Sure, dependable, reliable, constant, unwavering. **Steadfast**, staunch, steady imply a sureness and continuousness that may be depended upon.
Submerged	Cause (something) to be under water.
Tattered	Old and torn; in poor condition.
Trepidation	A feeling of fear or anxiety about something that may happen.
Unscrupulous	Having or showing no moral principles; not honest or fair.
Yields	Produce or provide (a natural, agricultural, or industrial product).

MODULE || 05

Analytical Reasoning

- Dealing Paths and Flow Charts with solved examples and Practice Drill.

Quantitative Reasoning

- Work
- Mixtures
- Solved Practice Drill

Verbal Reasoning

- Sentence Completion – Techniques and Practice questions, Solved Practice Drill.

Vocabulary

- Vocabulary to memorize (This vocabulary will be used in solving verbal questions in the next module)

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ANALYTICAL REASONING

DEALING PATHS AND FLOW CHARTS WITH SOLVED DRILLS

Flow charts and paths tend to be highly determinative. Once the chart has been constructed, the

questions typically can be answered with little additional thought - often all the answers can be discerned by merely reading the chart.

The catch is that the chart may not be easy to derive. Because this type of question typically has many

conditions, the chart can easily get out of control. Charting is an art. However, there are some guidelines

that help:

1. **Look for a condition that starts the "flow" or that contains a lot of information.**
2. **Look for an element that occurs in many conditions.**
3. **Keep the chart flexible; it will probably have to evolve with the changing conditions.**

Before we start, we need to address some of the hazards and symbols common to these questions.

Because flow charts and paths involve a "flowing" of information, the *if-then* symbol, →, is the workhorse for these games. Because the information can often "flow" in both directions, the symbol

"↔" also comes into play. A slash /► through a symbol indicates that information cannot flow in that direction. For example: A ↛ B means information cannot flow from A to B.

As you work through these games be alert to any opportunity to apply the contrapositive rule of logic.

Often negative conditions can be expressed more clearly by rewording them in the contrapositive. For example, the statement

"if it is not sunny, then Balouch is not going to the beach"

can be reworded more directly as *"if Balouch is going to the beach, then it is sunny."*

It is not necessary that both parts of the *if-then* statement be negative for this technique to be effective. For example, the statement *"if Lubna is hired, then Rehan is not"* can be recast as *"if Rehan is hired, then Lubna is not."* Although in this case the contrapositive statement is no simpler than the original, it may, and often does, open up connections to other conditions.

We need to review two common fallacies associated with the contrapositive. From the statement "if

A, then B" we can conclude, using the contrapositive, "if not B, then not A." It would be fallacious, however, to conclude either *"if not A, then not B"* or *"if B, then A."* Also note that *some* means "at least one and perhaps all."

Path questions are easy to identify; typically, they involve the actual movement of an element or of information. Some examples are

- Four cities are connected by six roads.
- A memo can be passed from Sara to Hira, but not from Sara to Jamshaid.
- If a litigant filed his case in federal court and lost, then he may appeal to the 4th District Court and from there to the Supreme Court.

Flow charts are harder to identify than paths. In fact, they can be quite cryptic. However, a game

with many *if-then* conditions is often a tip-off to a flow-chart questions. Unfortunately, the *if-then* thought is often embedded in other equivalent structures. For example, the sentence "All A's are B's" can be reworded as "If x is an A, then x is a B." For a fine example take the sentence "Lubna and Sara are not both hired"; it can be recast as "if Lubna is hired, then Sara is not" (or "if Sara is hired, then Lubna is not").

Example

Six debutantes - Ayesha, Beenish, Chandni, Dolly, Eman, and Fareeha - meet at a party.

During the time they have been at the party some girls have come to like certain other girls.

Amiable Ayesha likes every girl at the party.

Aloof, yet popular Beenish likes no one at the party, but everyone likes her.

Chandni likes only two girls, one of whom is Dolly.

Dolly likes three girls, none of whom are Chandni or Fareeha.

Eman and Fareeha each like only one girl.

1. Of the following girls, who likes Eman?

   I. Ayesha

   II. Dolly

   III. Fareeha

   A. I only B. II only

   C. III only D. I and II only

   E. I and III only

2. A "click" is a group of two or more girls who like one another. How many clicks are formed amongst the six girls?

   A. 0 B. 1

   C. 2 D. 3

   E. 4

3. How many girls at the party like at least one girl whose feelings are not reciprocal?

   A. 2 B. 3

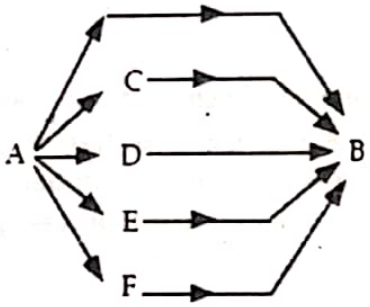
   C. 4 D. 5

   E. 6

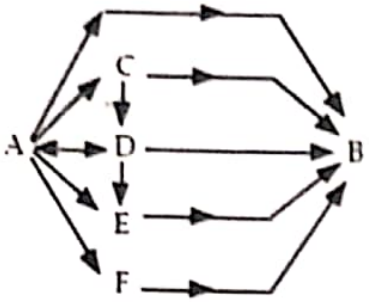
Hint for Explanation

Ayesha likes every girl, so we start the "flow" with her:

Next, every girl likes Beenish, but she does not like any of them. So we end the "flow" with Beenish. (Note how the diagram evolves.)



Next, since Dolly likes three girls, two of whom are neither Chandni nor Fareeha, she must like both Ayesha and Eman, in addition to Beenish. Adding this result plus the third condition, "*Chandni likes Dolly*," to the diagram gives



Finally, since Eman and Fareeha each like only one girl and everyone likes Beenish, Eman and Fareeha each must like Beenish only. So there is nothing else to add to the diagram.

Note A, C, D forms a "loop", because from A. The arrows can be followed all the way around the "loop" back to A. But A,D,E does not form a loop, because from A you cannot get back to A, whether you go first to D, or first to E.

SOLUTION:

Q 1.

In the chart, only arrows from A and D point to E. So only Ayesha and Dolly like Eman. The answer is (D).

Q 2.

There is only one. In the chart, a two-way arrow connects A and D, so they form a click. The loop A,C,D does not form a click because it's not two-way: A likes C, but that feeling is not reciprocal. The answer is (B).

Q 3.

In the chart, there are 5 arrows pointing to B, so 5 girls like B. There are no arrows emanating from B, so none of those feelings are reciprocal. The answer is (D).

CIRCUIT

Six lights - J, K, L, M, N, O - are connected in a circuit. Each light can be either on or off.

If K is on, L is off.

J and N cannot both be on.

M is off if and only if either J or N is on.

If O is on, N is on; if O is off, N is off.

1. How many lights in the circuit must be on?

   A. 0 B. 1

   C. 2 D. 3

   E. 4

2. If J is on, which one of the following could be a complete and accurate list of the other lights that are on as well?

   A. K and O B. L and N

   C. L and O D. M, N, and K

   E. L

Hint for explanation

To keep the notation simple, let the letter itself stand for "the light is on," and place a tilde before the letter to indicate that the light is off.

The condition "If K is on, L is off" is naturally symbolized as **K→~L.**

The condition "J and N cannot both be on" means that if one is on the other must be off: **N→~J.**

The condition "M is off if and only if either J or N is on" is naturally symbolized as **~M↔(J or N)**. Finally, the condition "If O is on, N is on; if O is off, N is off" means that O is on if and only if N is on: **O↔N.**

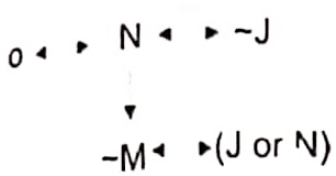
Now we come to the crucial decision - with which condition should we start our chart? Look for the element that occurs in the greatest number of conditions; it is N. Of the three conditions that contain N, the condition **O↔N** is the most restrictive, so we start the flow with it:

O↔N

Next, adding the condition **N→~J** gives

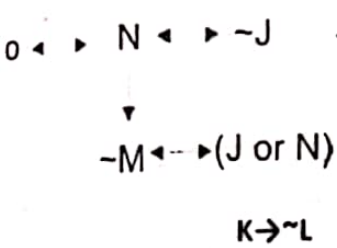
O↔N→~J

Then, adding the condition ~M↔(J or N) gives



Finally, the condition K→~L is independent of the other conditions, so the flow chart consists of

two distinct parts:



We will use only this chart to answer the questions.

SOLUTIONS:

Q 1.

From the bottom chart, we see that both K and L can be off. (The condition **K→~L** states only that

if K is on then L is off. It says nothing about the case when K is off, so both K and L *could be* off.)

Furthermore, since the bottom chart is independent of the top chart, the status of K and L (whether on or

off) does not affect the other lights. Next, from the top chart if both O and N are on, then both J and M must be off. Thus it is possible for only two lights, O and N, to be on, which eliminates (D) and (E). Next, we check the alternative circumstance where both O and N are off. From the top chart, we see that if M is also off, then J must be on. While if M is on, J cannot be on. Combining these cases (M *on* or *off*), we see that one and only one of M, J, and N must be on. Hence it is possible for only one element to be on, which eliminates (C). Finally, we check whether all the lights could be off. Again, the top chart shows that this is not possible: if M is off, then either N or J must be on, which eliminates (A) - at least one light must be on. The answer, therefore, is (B).

Q 2.

Notice that (A), (B), (C), and (D) all contain either N or O, but not both. However, the condition **O↔N**

states that they are always on at the same time. This eliminates (A) through (D).

Answer is option (E).

Topic Drill

Question 1 to 5 are based on following statement

Seven small towns—H, I, J, K, L, M, N—are serviced by three roads—Routes 1, 2, and 3.

Route 1 ends at N and L, and passes through M only.

Route 2 starts at H. Then passes through L and I, and ends back at H.

Route 3 ends at N and K, and passes through J only.

Two towns are directly connected if a person can drive from one of the towns to the other without passing through any other town.

1. Of the following towns, which one has the greatest number of direct connections?

A. H
B. N
C. J
D. K
E. L

2. Which one of the following towns has the fewest number of connections, direct or otherwise, with the other towns?
A. H
B. K
C. N
D. L
E. I

3. If a new road were built directly connecting I and J, and if all the direct connections between the towns were of equal distance, then in which one of the following pairs of towns is neither town on the shortest route connecting L and K?
A. J, H
B. H, I
C. I, J
D. N, I
E. M, N

4. If a new road were built directly connecting H and K, then the maximum number of paths connecting L to J, which do not pass through any town more than once, would be
A. 1
B. 2
C. 3
D. 4
E. 5

5. If two new roads were built directly connecting L to J and K to H, then which one of the following is NOT a complete and accurate list of the towns through which a person could pass on a single trip from L to H?
A. I
B. J, K
C. M, N, J, K
D. No town
E. M, N, K

Questions 6-7

Six lights—J, K, L, M, N, and O—are connected in a circuit. Each light can be either on or off.

If K is on, N is on.

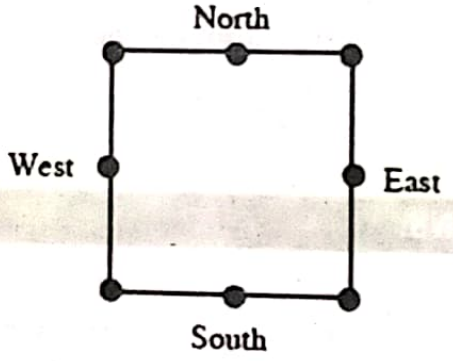
J and N cannot both be on.

If O is on, N is on; if O is off, N is off.

6. If K is on, which one of the following must be true?
A. L is on.
B. L is off.
C. J is off.
D. M is on.
E. N is off.

7. If J is on, what is the maximum number of lights that can be off?
A. 1
B. 2
C. 3
D. 4
E. 5

Questions 8-9



Eight benches—J, K, L, T, U, X, Y, and Z—are arranged along the perimeter of a park as shown below:

The following is true:

J, K, and L are green; T and U are red; X, Y, and Z are pink.

The green benches stand next to one another along the park's perimeter.

The pink benches stand next to one another along the park's perimeter.

No green bench stands next to a pink bench.

The bench on the southeast corner is T.

J stands at the center of the park's north side.

If T stands next to X, then T does not also stand next to L.

8. For which one of the following benches are there two and no more than two locations either one of which could be the location the bench occupies?

A. K
B. T
C. X
D. Y
E. Z

9. If Z is directly north of Y, which one of the following statements must be true?

A. J is directly west of K.
B. K is directly east of U.
C. U is directly north of X.
D. X is directly south of J.
E. Z is directly south of J.

Questions 10–11

Six people—Jamal, Khadim, Maria, Nabeela, Uzma, and Tamoor—participate in a track meet. Two of them enter the marathon, two enter the relay, and two enter the sprint.

Each participant enters only one event.

If Khadim enters the marathon, then both Jamal and Maria enter the relay, and if both Jamal and Maria enter the relay, then Khadim enters the marathon.

If Nabeela does not enter the sprint, then Tamoor enters the relay.

If Uzma enters the relay, then Jamal does not enter the relay.

Uzma and Tamoor do not both enter the relay.

10. If Khadim enters the marathon, then which one of the following cannot be true?

A. Jamal enters the relay and Nabeela enters the sprint.
B. Uzma enters the marathon and Nabeela enters the sprint.
C. Tamoor enters the marathon and Uzma enters the sprint.
D. Tamoor enters the relay and Uzma enters the sprint.
E. Tamoor enters the marathon and Maria enters the relay.

11. If both Khadim and Uzma enter the relay, then which one of the following must be true?

A. Jamal and Tamoor enter the marathon.
B. Maria enters the marathon.
C. Maria enters the sprint.
D. Tamoor enters the sprint.
E. Nabeela enters the sprint.

Questions 12–13

A lake contains exactly five islands—J, K, L, M, O—which are unconnected by bridges. Contractors will build a network of bridges that satisfies the following specifications:

Each bridge directly connects exactly two islands with each other, and no two bridges intersect.

No more than one bridge directly connects any two islands.

No island has more than three bridges that directly connect it with other islands.

J, K, and L are each directly connected by bridge with one or both of M and O.

J is directly connected by bridge with exactly two islands.

K is directly connected by bridge with exactly one island.

A bridge directly connects J with O, and a bridge directly connects M with O.

12. If a bridge directly connects K with O, then which one of the following could be true?

A. No bridge directly connects L with M.

B. A bridge directly connects J with L.

C. A bridge directly connects L with O.

D. There are exactly three bridges directly connecting L with other islands.

E. There are exactly two bridges directly connecting O with other islands.

13. If no island that is directly connected by bridge with M is also directly connected by bridge with O, then there must be a bridge directly connecting

A. J with L
B. J with M
C. K with O
D. L with M
E. L with O

Questions 14–17

There are five employees—G, H, I, J, and K—in an office. Rumors spread through the office according to the following rules.

Rumors can pass from G to H, but not vice versa.

Rumors can pass from G to I, but not vice versa.

Rumors can pass from G to J, but not vice versa.

Rumors can pass in either direction between H and I.

Rumors can pass from H to J, but not vice versa.

Rumors can pass from J to I, but not vice versa.

Rumors can pass in either direction between J and K.

A direct path from one person to another is called a segment.

14. A rumor begun by I that reaches K will be known by all the following employees EXCEPT:

A. I
B. G
C. K
D. H
E. J

15. If all segments have the same length and if rumors always follow the shortest path, then the longest path any rumor follows in the system is the path from

A. H to J
B. J to K
C. H to G
D. I to J
E. I to K

16. Which of the following is a complete and accurate list of the people to whom a rumor can be spread along exactly one segment from H?

A. I
B. J
C. I, J
D. I, J, K
E. I, J, G

17. If a two-way segment from K to G is added to the rumor mill, which of the following segments would have to be added to the system so that each person could spread a rumor directly to at least two other people and receive a rumor directly from at least two other people?

A. I to J
B. H to G
C. K to H
D. I to G
E. J to H

Questions 18–19

A Hollywood production company is hiring six people—Jahangir, Kamal, Maria, Noreen, Uzma, and Tanveer. Two of them are hired as editors, two as gaffers, and two as actors.

Each person is hired for only one job.

If Kamal is hired as an editor, then both Jahangir and Maria are hired as gaffers, and if

both Jahangir and Maria hired as gaffers, then Kamal is hired as an editor.

If Noreen is not hired as an actor, then Tanveer is hired as a gaffer.

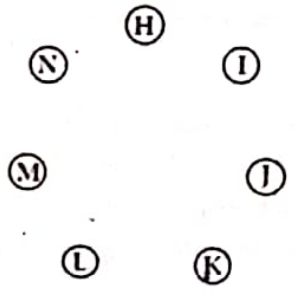
18. If Kamal is hired as an editor, then which one of the following cannot be true?
    A. Noreen and Tanveer are hired as actors.
    B. Uzma is hired as an actor, and Tanveer as an editor.
    C. Uzma and Noreen are hired as actors.
    D. Tanveer is hired as a gaffer and Uzma is hired as an actor.
    E. Neither Jahangir nor Maria are hired as editors.

19. If both Kamal and Uzma are hired as gaffers, then which one of the following must be true?
    A. Noreen is hired as an editor.
    B. Tanveer is hired as an actor.
    C. Jahangir is hired as an actor
    D. Jahangir and Tanveer are hired as editors
    E. Noreen is hired as an actor.

HINT FOR ANSWERS AND EXPLANATION

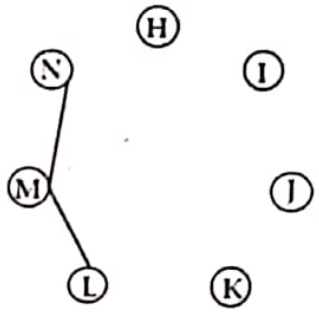
Hint for Questions 1–5

Diagramming makes this a fairly easy game.

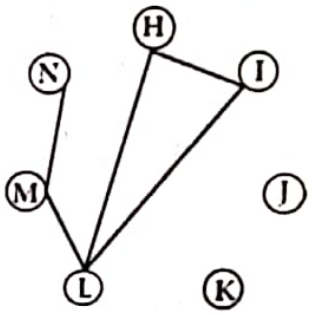


Start by placing the seven towns in a circle:*

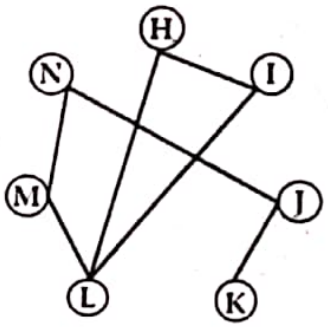
Next, add Route 1 to the diagram:



Then, add Route 2:



Finally, add Route 3:



Q 1.

From the chart, there are three roads going to L, and no other town has more than two roads going to it. Hence the answer is (E).

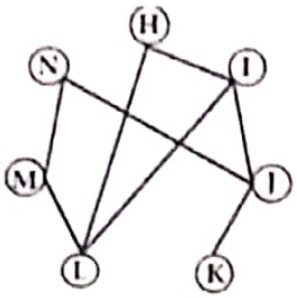
Q 2.

Again from the chart, there is only one road going to K, and every other town has at least two

roads going to it. So K has the fewest number of connections. The answer is (B).

Q 3.

Adding the new road to the chart gives

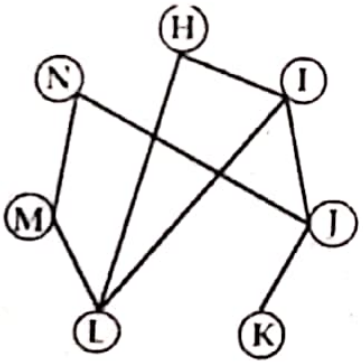


Now the shortest route from L to K passes through I and J:

Clearly, in this diagram, neither M nor N is on the shortest path from L to K. The answer is (E).

Q 4.

Adding the new road to the original diagram yields

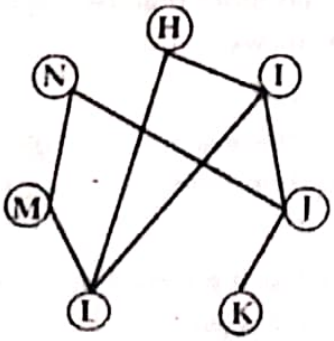


The following chart display the only three possible paths from L to J:

Hence the answer is (C).

Q 5.

Adding the new roads to the chart gives



The route in choice (E) directly connects either M or N to K, but in the chart there is no road directly connecting M or N to K. Hence this is impossible, and the answer is (E).

Hint for Questions 6-7

Let the letter itself stand for "the light is on," and place a tilde before the letter to indicate that the light is off. We begin the chart with the condition "If O is on, N is on; if O is off, N is off," which means that O is on if and only if N is on:

$$O \Leftrightarrow N$$

Next, the condition "J and N cannot both be on

$$O <-> N -\!\!\!\!\sim J$$
$$\uparrow$$
$$K$$

"means that if one is on the other must be off:

$$N \Rightarrow \sim J.$$

Adding this to the diagram yields

$$O \Leftrightarrow N \Rightarrow \sim J$$

Finally, adding the condition "If K is on, N is on," $K \Rightarrow N$, to the chart gives

Questions

Q 6.

In the diagram, a sequence of arrows "flows" from K to N to ~J. Hence, J must be off.

The answer is (C).

Q 7.

The fact that J is on prompts us to apply the contrapositive to the diagram:

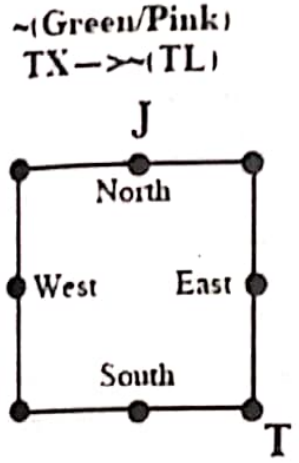
This shows that at least 3 lights must be off. Now, no conditions apply to either L or M. So their status—whether on or off—is independent of the other lights. Hence, both could be off.

This gives a maximum of 5 lights off. The answer is (E).

Hint for Questions 8–9

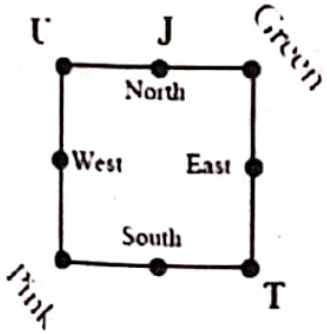
The condition "If T stands next to X, then T does not also stand next to L" can be symbolized as

TX—>~(TL). Summarizing the remaining conditions yields the following diagram:



The parentheses around the green and the pink benches remind us that these benches form groups.

Since the green benches cannot be next to the pink benches, the red benches—T and U—must separate them. Now, the pink benches form a group of three, so they must be located on the west and south borders where there is sufficient room. This in turn forces U into the northwest corner of the park, separating the pink benches from the green benches.



Questions

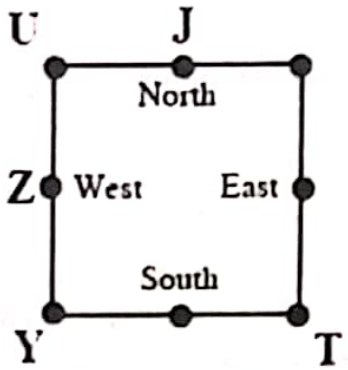
Q 8.

Since K is green, we see from the diagram it must be either the middle bench on the east side

or the bench on the northeast corner. The answer is (A).

Q 9.

Placing the condition "Z is directly north of Y"



on the diagram yields

This forces X between Y and T:

This diagram clearly shows X is directly south of J. The answer is (D).

Hint for Questions 10–11

The condition "If Khadim enters the marathon, then both Jamal and Maria enter the relay, and if both Jamal and Maria enter the relay, then Khadim enters the marathon" means that Khadim enters the marathon if and only if both Jamal and Maria enter the relay. This can be symbolized as

(K=Ma)<—>(J & M=R)

The condition "Uzma and Tamoor do not both enter the relay" means that if Uzma enters the relay, then Tamoor does not. This in turn can be symbolized as

(O=R)—>(T≠R)*

The remaining conditions can be symbolized in like manner, which yields the following schematic:

(K=Ma) <—> (J & M=R)

(O = R)—> (T ≠ R)

(N≠S)—> (T=R)

(O=R)—> (J≠≠ R)

Q 10.

If Khadim enters the marathon, then from **(K= Ma)<—>(J & M = R)** we know that both Jamal and Maria enter the relay. Look at choice (D); it has Tamoor in the relay. This puts three people—Jamal, Maria, and Tamoor—in the relay, violating the fact that only two people enter each

event. The answer is (D).

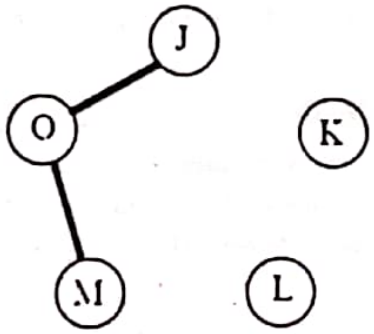
Q 11.

Since Khadim and Uzma fill the two relay entries, no one else enters the relay. Consider the condition **(N≠S)—>(T=R)** and take the contrapositive to obtain **(T≠R)—>(N=S)**. Now, since Tamoor cannot enter the relay, Nabeela enters the sprint. The answer is (E).

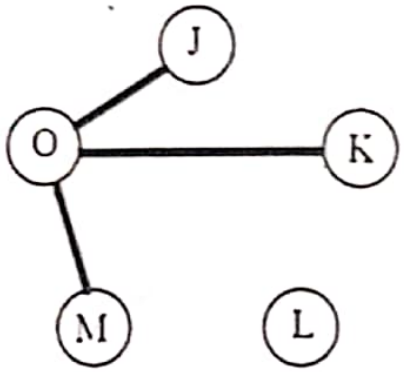
Hint for Questions 12–13

At first glance, this problem appears daunting. However, a diagram will greatly simplify it.

Place the condition "A bridge directly connects J with O, and a bridge directly connects M with O" on a diagram:



Q 12.

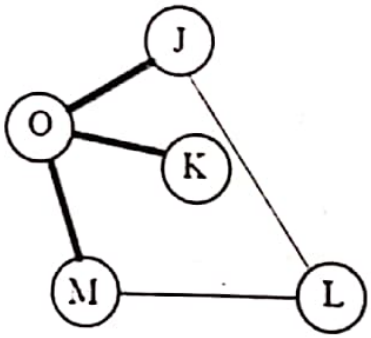


Add the condition "a bridge directly connects K with O" to the diagram:

The condition "J, K, and L are each directly connected by bridge with one or both of M and O" tells us that L must be directly connected to either M or O. However, L cannot be directly

connected to O since O is already directly connected to three other islands. Hence, L must be directly connected to M:

This diagram eliminates choice (A). Turning to choice (B), suppose a bridge directly connects J with L:



This diagram directly connects J, K, and L with M or O; J with exactly two islands; K with exactly one island; J with O; and M with O.

Hence, J could be directly connected with L. The answer is (B).

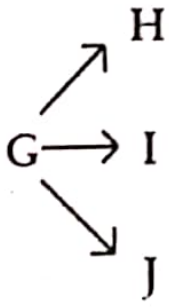
Q 13.

J cannot be directly connected to M since J is directly connected to O (see original diagram)—otherwise it would violate the premise of this question. Further, J cannot be directly connected to K since K is directly connected to exactly one other island, M or O.

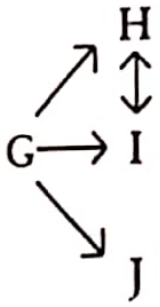
Therefore, as J must be directly connected to exactly two other islands, it must be directly connected to L. The answer is (A).

Hint for Questions 14–17

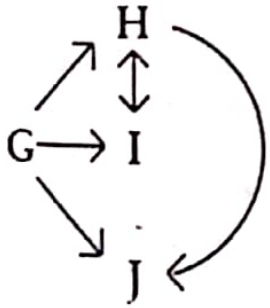
The first three conditions yield the following diagram:



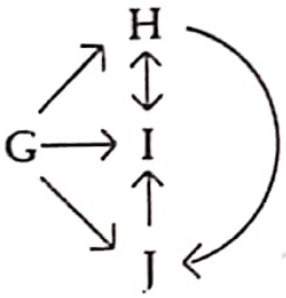
Adding the fourth condition yields

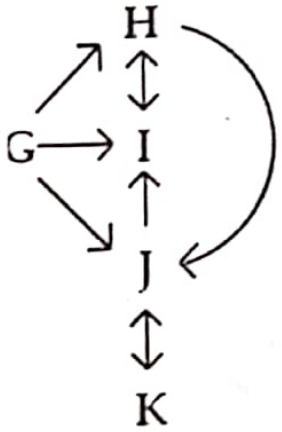


Adding the fifth condition yield



Adding the sixth condition yields

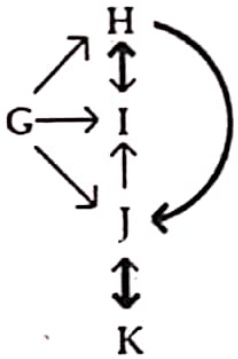




Finally, adding the last condition yields

Q 14.

The rumor can pass from I to H, and from H to J, and from J to K. This scenario has the rumor passing from I to K without passing through G. The answer is choice (B). The following diagram



illustrates the path from I to K:

Q 15.

Begin with choice (A). The original diagram shows that a rumor can spread directly from H to J, so this is unlikely to be the longest path. Turning to choice (B), the diagram shows that a rumor can also spread directly from J to K.

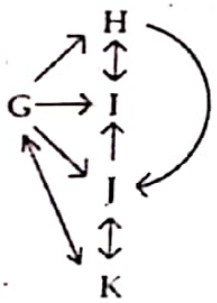
Since there cannot be two answers, this eliminates both (A) and (B). Turning to choice (C), the diagram clearly shows that no rumor can spread from H to G, eliminate. Turning to choice (D), the diagram shows that a rumor originating at I can spread directly only to H and then from H to J. This rumor consists of 2 segments. Finally, the path taken in choice (E) includes the path in choice (D) plus one additional segment from J to K. Hence, the answer is (E).

Q 16.

The original diagram shows arrows leading directly from H to I and to J, and only to these two. Hence, the answer is (C). As to the other choices, both (A) and (B) are incomplete since we just showed that there are direct paths leading from H to both I and J.
Choice (D) is inaccurate since a rumor cannot pass from H to K without passing through J. Hence, a rumor needs at least two segments to reach K from H. Finally, choice (E) is inaccurate: No arrow points from H (nor from any other person) to G. Hence, no rumors can pass from H (nor from any other person) to G.

Q 17.

Adding the new condition to the diagram



Yields

Now, look at choice (D). If there were a segment from I to G, then I could spread rumors to both H and G and could receive rumors from both H and G. Further, H could spread rumors to both I and J and could receive rumors from both G and I. J could spread rumors to both I and K and could receive rumors from both G and K. K could spread rumors to both G and J and could receive rumors from both G and J. Finally, G could spread rumors to both I and K and could receive rumors from both I and K. The answer is choice (D).

Hint for Questions 18–19

The condition "If Kamal is hired as an editor, then both Jahangir and Maria are hired as gaffers, and if both Jahangir and Maria hired as gaffers, then Kamal is hired as an editor" means that Kamal is hired as a editor if and only if both Jahangir and Maria are hired as gaffers. This can be symbolized as

(K=E)<—>(J & M=G)

The condition "If Noreen is not hired as an actor, then Tanveer is hired as a gaffer." can be symbolized as

(N≠A)—>(T=G)

Q 18.

If Kamal is hired as an editor, then from **(K=E)<—>(J & M=G)** we know that both Jahangir and Maria are hired as gaffers. Look at choice (D); it has Tanveer hired as a gaffer. This forces three people—Jahangir, Maria, and Tanveer—to be gaffers, violating the fact that only two people are hired for each position. The answer is (D).

Q 19.

Since Kamal and Uzma fill the two gaffer positions, no one else is hired as a gaffer. Consider the condition **(N≠A)—>(T=G)** and take the contrapositive to obtain **(T≠G)—>(N=A)** Now, since Tanveer cannot be hired as a gaffer (those two positions are already filled by Kamal and Uzma), Noreen is hired as an actor. The answer is (E).

QUANTITATIVE

WORK AND TIME PROBLEM

Most of the aptitude questions on time and work can be solved if you know the basic correlation between time, work and man-hours which you have learnt in your high school class.

Analogy between problems on time and work to time, distance and speed:

- Speed is equivalent to rate at which work is done
- Distance travelled is equivalent to work done.
- Time to travel distance is equivalent to time to do work.

Man - Work - Hour Formula:

- More men can do more work.
- More work means more time required to do work.
- More men can do more work in less time.
- M men can do a piece of work in T hours, then

$$\text{Total effort or work} = MT \text{ man hours}$$

Total effort or work = MT man hours

- Rate of work $\times$ Time = Work Done
- If A can do a piece of work in D days, then A's 1 day's work = $1/D$.
  Part of work done by A for t days = t/D.
- If A's 1 day's work = 1/D, then A can finish the work in D days.

$$\frac{MDH}{W} = Contant$$

Where
M = Number of men
D = Number of days
H = Number of hours per day
W = Amount of work

If M_1 men can do W_1 work in D_1 days working H_1 hours per day and M_2 men can do W_2work in D_2 days working H_2 hours per day, then

$$\frac{M_1 D_1 H_1}{W_1} = \frac{M_2 D_2 H_2}{W_2}$$

If A is x times as good a workman as B, then:

Ratio of work done by A and B = x : 1

Ratio of times taken by A and B to finish a work = 1: x i.e.; A will take (1/x)th of the time taken by B to do the same work.

Topic Drill

1. A person crosses a 600 m long street in 5 minutes. What is his speed in km per hour?
   A. 3.6 B. 7.2
   C. 8.4 D. 10
2. An aero plane covers a certain distance at a speed of 240 kmph in 5 hours. To cover the same distance in $1\frac{2}{3}$ hours, it must travel at a speed of:
   A. 300 kmph B. 360 kmph
   C. 600 kmph D. 720 kmph
3. If a person walks at 14 km/hr instead of 10 km/hr, he would have walked 20 km more. The actual distance travelled by him is:
   A. 50 km B. 56 km

C. 70 km D. 80 km

4. A train can travel 50% faster than a car. Both start from point A at the same time and reach point B 75 kms away from A at the same time. On the way, however, the train lost about 12.5 minutes while stopping at the stations. The speed of the car is:

A. 100 kmph B. 110 kmph

C. 120 kmph D. 130 kmph

5. Excluding stoppages, the speed of a bus is 54 kmph and including stoppages, it is 45 kmph. For how many minutes does the bus stop per hour?

A. 9 B. 10

C. 12 D. 20

6. A can do a work in 15 days and B in 20 days. If they work on it together for 4 days, then the fraction of the work that is left is:

A. 1/4 B. 1/10

C. 7/15 D. 8/15

7. A can lay railway track between two given stations in 16 days and B can do the same job in 12 days. With help of C, they did the job in 4 days only. Then, C alone can do the job in:

A. $9\frac{1}{5}$ days B. $9\frac{2}{5}$ days

C. $9\frac{3}{5}$ days D. 10

8. A, B and C can do a piece of work in 20, 30 and 60 days respectively. In how many days can A do the work if he is assisted by B and C on every third day?

A. 12 days B. 15 days

C. 16 days D. 18 days

9. A is thrice as good as workman as B and therefore is able to finish a job in 60 days less than B. Working together, they can do it in:

A. 20 days B. 22 1/2 days

C. 25 days D. 30 days

10. A alone can do a piece of work in 6 days and B alone in 8 days. A and B undertook to do it for Rs. 3200. With the help of C, they completed the work in 3 days. How much is to be paid to C?

A. Rs. 375 B. Rs. 400

C. Rs. 600 D. Rs. 800

SOLUTIONS

Q 1.

Speed $=\left(\frac{600}{5\times60}\right)$ m/sec = = 2 m/sec.

Converting m/sec to km/hr = $2 \times \frac{18}{5}$ km/hr = 7.2 km/hr

Q 2.

Distance = (240 x 5) = 1200 km.

Speed = Distance/Time

Speed = 1200/(5/3) km/hr. [We can write 1 $\frac{2}{3}$ hours as 5/3 hours]

Required speed = $(1200 \times \frac{3}{5})$ km/hr = 720 km/hr.

Q3.

Let the actual distance travelled be x km.

Then, $\frac{x}{10} = \frac{x+20}{14}$

$14x = 10x + 200$

$4x = 200$

$x = 50$ km.

Q 4.

Let speed of the car be x kmph.

Then, speed of the train = $\frac{150}{100}x = \left(\frac{3}{2}x\right)$ kmph

$\therefore \frac{75}{x} - \frac{75}{(3/2)x} = \frac{125}{10 \times 60}$

$\Rightarrow \frac{75}{x} - \frac{50}{x} = \frac{5}{24}$

$\Rightarrow x = \left(\frac{25 \times 24}{5}\right) = 120$ kmph

Q5.

Due to stoppages, it covers 9 km less.

Time taken to cover 9 km = $\frac{9}{54} \times 60$ min = 10 min.

Q6.

A's 1 day's work = 1/15

B's 1 day's work = 1/20

(A + B)'s 1 day's work = $(\frac{1}{15} + \frac{1}{20} = \frac{7}{60})$

(A + B)'s 4 day's work = $(\frac{7}{60} \times 4) = 7/15$

Therefore, Remaining work = $1 - \frac{7}{15} = \frac{8}{15}$

Q7.

(A + B + C)'s 1 day's work = 1 /4

A's 1 day's work = 1/16

B's 1 day's work = 1/12

Therefore

$\therefore$ C's 1 day's work = $\frac{1}{4} - \left(\frac{1}{16} + \frac{1}{12}\right) = \left(\frac{1}{4} - \frac{7}{48}\right) = \frac{5}{48}$

So C alone can do the work in $\frac{48}{5} = 9\frac{3}{5}$ days

Q8.

A's 2 day's work = $\left(\frac{1}{20} \times 2\right) = \frac{1}{10}$

(A + B + C)'s 1 day's work = $\left(\frac{1}{20} + \frac{1}{30} + \frac{1}{60}\right) = \frac{6}{60} = \frac{1}{10}$

Work done in 3 days = $\left(\frac{1}{10} + \frac{1}{10}\right) = \frac{1}{5}$

Now, $\frac{1}{5}$ work is done in 3 days.

$\therefore$ Whole work will be done in (3 x 5) = 15 days.

Q9.

Ratio of times taken by A and B = 1 : 3.

The time difference is (3 - 1) 2 days while B take 3 days and A takes 1 day.

If difference of time is 2 days, B takes 3 days.

If difference of time is 60 days, B takes $(\frac{3}{2} \times 60$ = 90 days.

So, A takes 30 days to do the work.

A's 1 day's work = 1/30

B's 1 day's work = 1/90

(A + B)'s 1 day's work = $(\frac{1}{30} + \frac{1}{90}) = 4/90 = 2/45$

A and B together can do the work in $45 = 22\frac{1}{2}$ days.

Q10.

C's 1 day's work = $\frac{1}{3} - \left(\frac{1}{6} + \frac{1}{8}\right) = \frac{1}{3} - \frac{7}{24} = \frac{1}{24}$

A's wages : B's wages : C's wages = $\frac{1}{6} : \frac{1}{8} : \frac{1}{24} = 4 : 3 : 1$.

$\therefore$ C's share (for 3 days) = Rs $\left(3 \times \frac{1}{24} \times 3200\right)$ = Rs. 400

MIXTURE

When two or more components are mixed in a certain ratio, a mixture is created.

Types of mixtures

Simple Mixtures

When two or more different ingredients are mixed together, a simple mixture is formed.

Compound Mixtures

When two or more simple mixtures are mixed together, a compound mixture is formed.

Alligation

To understand the concept of alligations, let's take an example and look at it from all dimensions possible.

Example

30 boys with an average weight of 60 kg and 20 girls with an average weight of 40. Find the average weight of the whole class?

Solution

To find the answer to the above question, one can use the formula for weighted average. Suppose the question was framed a bit differently, the Average weight of boys is 60, the average weight of girls is 40 and average weight of the whole class is 52.

Find the ratio between the number of boys and girls

Solution

The fastest way to solve this question would be by using Alligation.

So what exactly is Alligation?

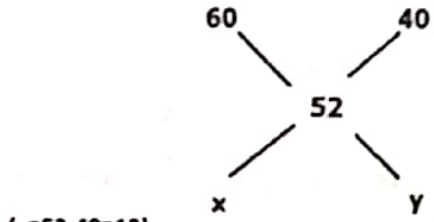
It is the reverse of weighted average; i.e. If the averages of two groups are separately given and the average of the whole group is given, then we can find out the ratio between the groups.

For example, in the above question, the data given is:

Average weight of boys = 60

Average weight of girls = 40

Average weight of the whole class is = 52



(x=52-40=12) *(y= 60-52=8)*

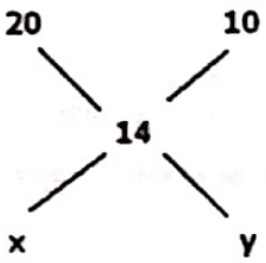
The data can be represented in an Alligation chart as given below and use it to find the ratio between the number of boys and girls in the class.

Take the difference across: x = 60 – 52 = 8 and y = 52 – 40 = 12. That is how we get the ratio between the boys and girls as 12:8 or 3:2.

Let's look at another question where you can use Alligation.

Example

In what ratio should a shopkeeper mix two types of rice, one costing 20 rupees/kg and another costing 10 rupees/kg to get a rice variety costing 14 rupees/kg



Here also we can use Alligation as follows:

X = 14 – 10 = 4 y = 20 – 14 = 6 The ratio between the type 1 and type 2 rice is 4:6 or 2:3.

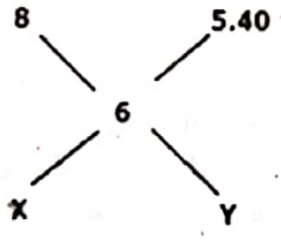
Example

How many must kg of rice costing Rs 8 per kg be mixed with 36 kg of rice costing Rs 5.40 per kg so that 20% gain most be obtained by selling the mixture at Rs 7.20 per kg?

a) 10 kg b) 12 kg
c) 10.8 kg d) 8 kg

Solution

Always remember that we need to take only the cost price and not the selling price when we consider the price of all entities in the question. In the question, the selling price of the mixture is given. We need to find out the cost price using the profit percentage given = 20%. Cost price × 1.2 = 7.2, implies that cost price of the mixture is 6.



From the Alligation chart,
X = 6 - 5.40 = 0.6 and Y = 8 – 6 = 2
Thus the ratio between the quantity of type A rice and type B rice is 0.6:2 or 3:10 Therefore; x = 10.8 kg.

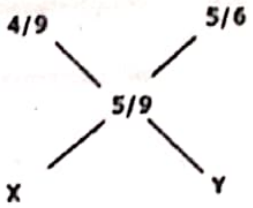
Example

Vessel A contains milk and water in the ratio 4:5. Vessel B contains milk and water in the proportion 5:1. In what proportion should quantities be taken from A and B to form a mixture in which milk and water are in the ratio 5:4?

a) 2:5 b) 3:2
c) 2:3 d) 5:2

Solution

For this question, let's consider the proportion of milk in each mixture. In Vessel A, the proportion of milk in 4/(4 + 5) = 4/9. In vessel B, the proportion of milk is 5/(5+1) = 5/6.



The amount of milk in the mixture= 5/((5 + 4)) = 5/9
X = (5/6) - (5/9) = 5/18
Y = (5/9) - (4/9) = 1/9
The ratio is (5/18):(1/9) = 5:2

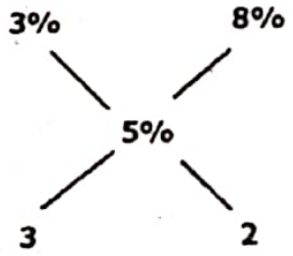
Example

A person has Rs.5000. He invests a part of it at 3% per annum and the remainder at 8% per annum simple interest. His total income in 3 years is Rs.750. Find the sum invested at different rates of interest?

a) 3500, 1500 b) 1000, 4000
c) 3000, 2000 d) 1800, 3200

Solution

He is investing part of it at 3% at annum and remaining at 8% per annum since he is getting Rs 750 as profit for 3 years, rate percent of the whole amount is 5%



That can be calculated from
PNR/100 = 750 ((5000 ×3 ×R))/100 = 750 R= 5%
(PNR = Principal Amount × Number of years × Rate of Interest)
From the Alligation chart, the ratio of investment will be 3:2. Look at the answer options for that ratio. Only option (c) (3000, 2000) gives that ratio.

Topic Drill

1. Tea worth Rs. 126 per kg and Rs. 135 per kg are mixed with a third variety in the ratio 1 : 1 : 2. If the mixture is worth Rs. 153 per kg, the price of the third variety per kg will be:

   A. Rs. 169.50 B. Rs. 170
   C. Rs. 175.50 D. Rs. 180

2. A can contains a mixture of two liquids A and B is the ratio 7 : 5. When 9 liters of mixture are drawn off and the can is filled with B, the ratio of A and B becomes 7 : 9. How many liters of liquid A was contained by the can initially?

   A. 10 B. 20
   C. 21 D. 25

3. A milk vendor has 2 cans of milk. The first contains 25% water and the rest milk. The second contains 50% water. How much milk should he mix from each of the containers so as to get 12 liters of milk such that the ratio of water to milk is 3 : 5?

   A. 4 liters, 8 liters B. 6 liters, 6 liters
   C. 5 liters, 7 liters D. 7 liters, 5 liters

4. In what ratio must a grocer mix two varieties of pulses costing Rs. 15 and Rs. 20 per kg respectively so as to get a mixture worth Rs. 16.50 kg?

   A. 3 : 7 B. 5 : 7
   C. 7 : 3 D. 7 : 5

5. Suni started a juice (lemon syrup + water) counter. Initially he had 140-liter juice which had 30% water in it. He sold 20 liters of the juice. Then he added equal amount of lemon syrup and water. Now the ratio of water to lemon syrup became 1:2. How much water was added later on?

   A. 9 liters B. 12 liters
   C. 14 liters D. 20 liters

6. Chandu buys some sugar at Rs. 15 per kg. He mixes it with sugar having price Rs. 12 per kg. The final mixture becomes worth Rs. 16 per kg. What is the ratio of quantities of type 1 sugar to type 2 sugar?

   A. 2:1 B. 1:2
   C. 5:6 D. 6:5

7. One can is completely filled and contains 100% water. Another similar can is completely filled with a solution of 50% wine and 50% water. When both the cans are emptied in a steel vessel, what will be ratio of water to wine in the vessel?

   A. 1:1 B. 1:3
   C. 2:1 D. 3:1

8. Rice and wheat are in a mixture in the ratio 5:3. If 16 kg wheat is added to this mixture, the ratio of rice to wheat changes to 5:7. How much wheat is in new mixture?

   A. 21 kg B. 28 kg
   C. 42 kg D. 35 kg

9. Raheel mixes 60 liters of Type-1 acid with some liters of Type-2 acid. Type-1 acid rate is Rs. 32 per liter while Type-2 rate is Rs. 23 per liter. Raheel sells this acid-mix at rate Rs. 28 per liter. How much Type-2 acid is needed to make it a no profit no loss transaction?

   A. 48 liters B. 36 liters
   C. 24 liters D. 50 liters

10. One glass has juice and water in the ratio 5:2 while other glass has them in ratio 7:4, respectively. If both glasses poured in a vessel, then what will be final ratio of water to juice in the vessel?

    A. 8:35 B. 52:25
    C. 35:8 D. 25:52

SOLUTIONS

Q1.

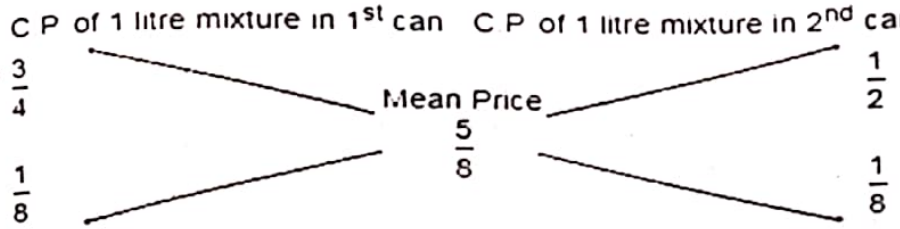
Answer is C

Milk in 1 litre mix in 1st can = $\frac{3}{4}$ litre C P of 1 litre mix in 1st can Re $\frac{3}{4}$

Milk in 1 litre mix in 2nd can = $\frac{1}{2}$ litre C P of 1 litre mix in 2nd can Re $\frac{1}{2}$

Milk in 1 litre of final mix = $\frac{5}{8}$ litre. Mean price = Re $\frac{5}{8}$

By the rule of alligation, we have



∴ Ratio of two mixtures = $\frac{1}{8} : \frac{1}{8} = 1 : 1$

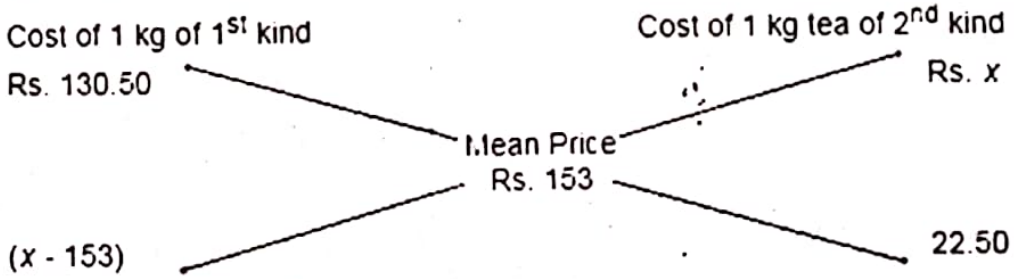
So, quantity of mixture taken from each can = $\left(\frac{1}{2} \times 12\right)$ = 6 litres.

Since first and second varieties are mixed in equal proportions.

So, their average price = Rs. $\frac{126 + 135}{2}$ = Rs. 130.50

So, the mixture is formed by mixing two varieties, one at Rs. 130.50 per kg and the other at say, Rs. x per kg in the ratio 2 : 2, i.e., 1 : 1. We have to find x.

By the rule of alligation, we have:



∴ $\frac{x - 153}{22.50} = 1$

x - 153 = 22.50

x = 175.50

Q2.

Answer is C

Suppose the can initially contains $7x$ and $5x$ of mixtures A and B respectively

Quantity of A in mixture left = $\left(7x - \frac{7}{12} \times 9\right)$ litres = $\left(7x - \frac{21}{4}\right)$ litres

Quantity of B in mixture left = $\left(5x - \frac{5}{12} \times 9\right)$ litres = $\left(5x - \frac{15}{4}\right)$ litres

$$\therefore \frac{\left(7x - \frac{21}{4}\right)}{\left(5x - \frac{15}{4}\right) + 9} = \frac{7}{9}$$

$$\Rightarrow \frac{28x - 21}{20x + 21} = \frac{7}{9}$$

$$\Rightarrow 252x - 189 = 140x + 147$$

$$\Rightarrow 112x = 336$$

$$\Rightarrow x = 3$$

So the can contained 21 litres of A.

Q3.

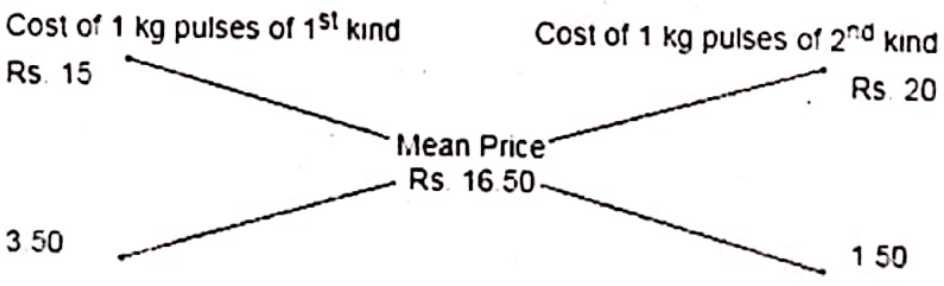
Answer is B

Let the cost of 1 liter milk be Re. 1

Q4.

Answer is C

By the rule of Alligation:



Required rate = 3.50 : 1.50 = 7 : 3.

Q5.

Initial amount of lemon syrup = 100% juice -30% water = **70% syrup**

Sunil sold 20 liter juice, so now he has 140-20 = 120 liter juice.

In this 120l juice, the ratio will be same i.e.30% water and 70% syrup

So, **amount of syrup** = 70% of 120 = **84liters.**

∴ **Amount of Water** = 120-84 = **36 liters.**

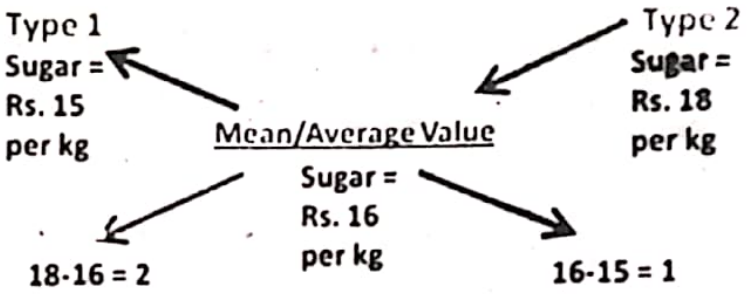
Now, let Sunil add 'A' liters of lemon syrup and 'A' liters of water.

As per given condition,

$$\frac{36+A}{84+A} = \frac{1}{2}$$

∴ **A = 12liters = Amount of water added**

Q6.



So, ratio of quantities of type 1 sugar to type 2 sugar = 2:1

Q7.

Since both cans are similar, let their capacity be 100 litres.

Can 1 has 100 litres water

And Can 2 has 50 litres wine and 50 litres of water

When mixed in steel vessel we get, 100+50 = 150 litres water and 50 litres wine

So **water : wine** = 150:50 = **3:1**

Q8.

If common factor is K, Rice is 5K kg and Wheat is 3K kg.

Also, $\frac{5K}{3K+16} = \frac{5}{7}$

∴ K = 4

∴ **New wheat quantity** = 3K+16 = **28kg**

Q9.

Let Type-2 acid quantity be T litres.

Final mixture has '60+T' litres

There is no profit no loss

So, **(Type-1 quantity x rate) + (Type-2 quantity x rate) = Mix quantity x rate**

$\therefore 60 \times 32 + T \times 23 = (60+T) \times 28$

$\therefore$ **T = 48 litres = Type-2 acid quantity**

10.

Glass 1 → Juice : Water = **5:2** → Total 5+2 = **7 parts** of liquid

Glass 2 → Juice : Water = **7:4** → Total 7+4 = **11 parts** of liquid

Vessel juice = Glass 1 Juice + Glass 2 Juice $= \frac{5}{7} + \frac{7}{11} = \frac{104}{77}$

Vessel Water = Glass 1 Water + Glass 2 Water $= \frac{2}{7} + \frac{4}{11} = \frac{50}{77}$

Water to Juice ratio $= \frac{50}{77} : \frac{104}{77} =$ **25:52**

VERBAL REASONING

SENTENCE COMPLETION

Sentence Completion is a common test item in most competitive exams. A sentence contains one or two blanks (usually), to be filled in using the choices. These questions test your vocabulary and knowledge of the finer distinctions among words. A good vocabulary can be a great help here. But you can use many strategies for these questions, even without knowing all the choices.

Read the Sentence

Use the sentence clues by reading the sentence thoroughly. Two things make a question difficult: difficult words and sentence structure. If you cannot dissect a sentence to figure out what fits best, you cannot crack the question though you know the word meanings.

Hints

The hints indicate what should go into the blank for the sentence to make sense. Here's a test to locate the right hint: if you change the hint, the choice in the blank must be changed. You can often use the hint by putting that word or phrase into the blank itself.

Pluses and Minuses

Once you find the word clues, indicate the kind of word you're looking for with a + (positive meaning) or - (negative) sign. Also, to indicate synonyms or antonyms, you can use these symbols.

Structure Words

Look for words like but, rather, although, however, and, while, but, therefore.

They reveal the sentence organization and the hint-blank relationship. They tell you what kinds of words to look for, as they change the thought process in the sentence.

Visualize

Before you go to the choices, think of the possible words for the blanks. It will save you from wrong choices. If you know roughly the kind of words needed, the elimination is much easier. The word you visualize doesn't have to be fancy-a general idea is fine.

EXAMPLE

Neem has --- qualities and in many clinical trials, doctor have saved countless lives by using raw Neem leaves on serious wounds.

A. remedial

B. flavoring

C. inferior

D. doubtful

E. notorious

Solution

We need a positive word with a "lifesaving"-like meaning. Choices C, D, and E are negative and are ruled out. You may be unaware of remedial but you know that "flavoring" doesn't mean anything like lifesaving. Therefore, the answer is remedial.

Example

The much-hated bill sparked off a wave of public_____which could not _____ by the concessions the Pakistanis announced.

A. enthusiasm.....dampened

B. clamor.....misled

C. curiosity.....complemented

D. adoration.....channelized

E. discontent.....abated

Solution

Much-hated indicates a negative choice for the first blank indicating anger or protest here. The second one needs harder thinking; even the Pakistanis concessions did not "lessen" the public anger. Once you are clear about the word shades needed, find the words similar to the ones you had visualized.

Elimination

Ruling out the wrong choices should be easy now. But remember, both the words have to fit in the given order for the right answer. If one word is a perfect choice but the other one doesn't make sense, the answer is wrong. Do not rule out choices if you don't know their meanings and unless you are sure they do not work. If you have doubts, leave and return after checking the other choices.

Working Backwards

The two-blank questions can be easier as you have more opportunities to eliminate wrong choices. If you can eliminate a choice based on one word, you don't need to know the other word. Often, working backwards i.e. picking the second blank choice first works better.

Topic Drill

1. Money ____ to a political campaign should be used for political purposes and nothing else.
   A. useD. B. forwarded
   C. contributeD. D. spent
   E. channeled

2. Although it was not apparent at the time, in _____ we can see how Ghulam Ali's performances in the 1970s were _____ by what was happening then in popular music.
   A. retrospect....influenced
   B. effect....modified
   C. fact...unchangeD.
   D. foresight....endangered
   E. time....engendered

3. Most candidates spend ____ they can raise on their campaigns, but others wind up on election day with a _____.
   A. so....bankroll
   B. time....vacation
   C. everything....surplus
   D. every pesa.....deficit
   E. nothing....war chest

4 Can public opinion be influenced so that it ____ rather than encourages the proliferation of the sale of firearms?
   A. redoubles B. advances
   C. inverts D. impedes
   E. amplifies

5. Philosophical problems arise when people and questions that, though very_____, have certain characteristics in common.
   A. relevant B. elementary
   C. abstract D. diverse

6. The tools found in the Harappa excavation are ____ as a single implement might have several edges, each with a different use.
   A. ancient B. primitive
   C. ferrous D. versatile
   E. reliable

7. Khalid should be _____ to complain since his salary is _____ with his productivity.
   A. loath – commensurate
   B. brought - alleviated
   C. right – balanceD.

D. entitled - gratuitous

E. foolish - proportionate

8. Muslim alchemists tried to attain wealth by _____ copper and other base metals into gold.

A. placing B. coin aging

C. melting D. transforming

9. The unique world of the film is _____, both wholly recognizable and unfamiliar.

A. contradictory B. realistic

C. simplistic D. timeless

E. unchanging

10. Editorial cartoonists cannot be successful unless they can _____ the consciences of their audience and stir up controversy.

A. assuage B. tweak

C. dwarf D. amuse

E. shield

11. Along with a handful of other _____ the lawyer refuses to believe the evidence submitted by the FIA.

A. investigators B. rationalists

C. regionalists D. legislators

E. skeptics

12. A virtuous person will not shout _____ in public; he or she will respect the _____ of other people.

A. obscenities.....feelings

B. loudly.....comfort

C. anywhere....presence

D. blessings.....cynicism

E. insults.....threat

13. The chairperson was noted for not being obstinate; on the contrary, the members praised her _____.

A. resistance B. experience

C. coherence D. verbosity

E. flexibility

14. Our _____ objections finally got us thrown out of the examination hall.

A. silent B. modest

C. wary D. vocal

E. suspicious

15. Take this medicine and you will get rid _____ the bad cold

A. of B. over

C. at D. from

16. It is dangerous to enter ___ the enemy's camp.

A. in B. at

C. on D. into

E. for

17. Students who are interested in foreign languages are encouraged to _____ their studies by adding courses in linguistics to their schedules.

A. accelerate B. condense

C. supplement D. prolong

E. duplicate

18. Known for her patience and kindness, Nurse Shamim is one of the most _____ employees in the entire hospital.

A. boorish B. benign

C. genial D. irritable

E. contrary

19. The program, which _____ housing for disadvantaged families, should be a tremendous ---- to the beneficiaries who are able to meet income requirements.

A. allows....detriment

B. provides....boon

C. insures....expenditure

D. includes....drawback

E. Eliminates....benefit

20. Her parents were _____ when, despite losing the first 3 games, _____ to win the set by a 6-3 score.
    A. surprised....failed
    B. relieved....came back
    C. puzzled....refused
    D. alarmed....attempted
    E. delighted....was unable

SOLUTIONS

Q1.

(C). How would you fill in the blank? maybe with the word given or donated? Now look at the choices and find a synonym for given or donated: The best choice is C contributed; it is the nearest synonym to given or donated and makes good sense in the sentence.

Channeled: the proper or official course of transmission of communications

Q2.

(A). The best choice is **A**. After reading the sentence, you Maria decide that the phrase not apparent at the time would suggest looking back for the first blank and that the second word needs to be affected. You could read the sentence "Although it was not apparent at the time, in looking back we can see how Miles Davis' performances in the 1970s were affected by what was happening then in popular music." Now, looking for synonyms for looking back and affected gives you choice **A** retrospect....influenced.

Retrospect: a looking back on or thinking about things past

Q3.

The best choice is **C**. But signals that the first half of the sentence contrasts with the second half. The fact that most candidates spent everything (and end up with nothing) contrasts with those who end up with a surplus.

Bankroll: a supply of money; available funds

Deficit: the amount by which a sum of money is less than the required amount

Q4.

The best choice is **D**. The clue here is rather than encourages. You need a verb whose object is proliferation and that means the opposite of encourages. The best choice is impedes, which means obstructs or retards. To invert is to turn upside down.

Proliferation: to reproduce (new parts) in quick succession

Impedes: to bar or hinder the progress of; obstruct or delay

Q5.

The best choice is **D**.

The key to the correct choice is in the word though, which indicates that the missing word must convey a sense which is the opposite of the phrase 'having certain characteristics in common', Among the choices, diverse (meaning various of differing in qualities), is the most suitable answer. The sentence now means that though people ask diverse questions, there are some common characteristics among them.

Q6.

The best choice is **D**. The tools the sentence describes have several edges and several uses, and the missing adjective should fit these conditions. Versatile means capable of many things.

Primitive: of or existing in the beginning or the earliest times or ages; ancient; original

Q7.

The best choice is **A**.

As Khalid's salary commensurate (equal to) his productivity he must be reluctant to (loath to) complain.

Q8.

The best choice is D.

They want to change copper and other common metals into gold. So the word transform is best suited.

Q9.

The best choice is A. The second part of this sentence, both wholly recognizable and unfamiliar is a perfect example of the word needed, contradictory. The words recognizable and unfamiliar contradict each other (are opposite).

Q10.

The best choice is **B**. The missing verb must mean something that will parallel stir up. Of the choices, only tweak (to irritate, pinch) will fit.

Cor.sciences: a knowledge or sense of right and wrong, with an urge to do right; moral judgment that opposes the violation of a previously recognized ethical principle and that leads to feelings of guilt if one violates such a principle

Tweak: to give a sudden, twisting pinch to (someone's nose, ear, cheek, etc.)

Q11.

(E). The best choice is **E**. The last half of the sentence describes a reluctance to believe–the action of a skeptic.

Rationalistic: the principle or practice of accepting reason as the only authority in determining one's opinions or course of action

Q12.

The best choice is **A**. The first blank is obviously a negative word, something that a good person would not shout; the second blank is a positive word, something that a good person would respect. Choice **B** is neutral-positive; **C** is neutral-neutral; **D** is positive-negative; **E** is negative-negative. Only choice **A** offers a negative-positive pair of words.

Obscenities: the state or quality of being obscene

Cynicism: the attitudes or beliefs of a cynical person

Q13.

The best choice is **E**. The correct answer must describe a praiseworthy quality opposite to obstinacy. Although **B** and **C** are good qualities, only flexibility, **E**, means pliancy, the quality of being flexible.

Obstinate: unreasonably determined to have one's own way; not yielding to reason or plea

Verbosity: using or containing too many words; wordy

Q14.

The best choice is **D**.

Vocal means loud voice that caused disturbance in the hall.

Q15.

The best choice is **A**.

Correct idiom is get rid of.

Q16.

The best choice is **D**.

The correct idiom is enter into.

Q17.

The best choice is **C**.

The main clue in this question is the phrase "adding courses in linguistics." This phrase explains how students can do what the missing word describes. By adding courses, one would be adding to "their studies," so the missing word must mean add. Because supplement means to make something more complete by adding to it, choice (C) is correct.

Q18.

The best choice is **C.**

The main clue in this question is the phrase "known for her patience and kindness." This phrase, like the missing word, describes Nurse Shamim, so the missing word must likewise mean patient or kind. Because genial means friendly and cheerful, choice (C) is correct.

Q19.

The best choice is **B.** Because there are many possibilities for the first blank, you wish to start with the second blank. The phrase a tremendous–to the beneficiaries tells you that this second blank must be a "positive" word, because being a heneficiary (one who benefits) is positive. So you should look for a positive second word and then try the first word. Choices **B** boon and **E** benefit are the only two answers with second words that fit. Now take each choice and see if the first word also fits. Choice **B** provides..boon (advantage) makes complete sense. Although the second word in choice **E** fits perfectly, the first word doesn't make sense in the sentence. Again, keep in mind that each word must fit for the answer to be correct.

Tremendous: such as to make one tremble; terrifying; dreadful

Detriment: damage; injury; harm

Boon: a request or the favor requested

Q20.

The best answer is B. There are no clues here to tell you which of the first words describes the reaction of the parents. Any of the five might work. But if you deal with the second blank first, you can see that the word despite makes it clear that Sally must win the set. Choice B came back looks like the best choice, although D is possible. That B is better is confirmed by the first word, as relieved is better than alarmed.

VOCABULARY

Following is a list of English words with meaning. You are advised to memorize all these words. All these words will be used in the Verbal section in the next module.

Word	Common Meaning
Appalachian	Of or relating to the **Appalachian** mountains.
Auxiliary	additional; supplementary; reserve
Chronological	(of a record of events) following the order in which they occurred
Collinear	(of points) lying in the same straight line
Congressional	(of a person or way of life) overindulging in sensual pleasures.
Consecutively	One after another without interruption.
Consequently	As a result.
Consolidated	Make (something) physically stronger or more solid.
Discrepancy	An illogical or surprising lack of compatibility or similarity between two or more facts.
Disenchantment	A feeling of disappointment about someone or something you previously respected or admired; disillusionment.
Dissipated	(of a person or way of life) overindulging in sensual pleasures.
Distinct	Recognizably different in nature from something else of a similar type.
Exorbitantly	exceeding the bounds of custom, propriety, or reason, especially in amount or extent; highly excessive
Familiarity	Close acquaintance with or knowledge of something
Handicapped	(of a person) having a condition that markedly restricts their ability to function physically, mentally, or socially.
Persuasiveness	able, fitted, or intended to persuade
Precipitation	The action or process of precipitating a substance from a solution.
Redistribution	The distribution of something in a different way, typically to achieve greater social equality.
Sequential	Forming or following in a logical order or sequence.
Simultaneous	Occurring, operating, or done at the same time.
Subsequent	Coming after something in time; following.

MODULE || 06

Analytical Reasoning

- Dealing Sequence with solved examples and Practice Drill

Quantitative Reasoning

- Age Problems
- Speed Problems
- Solved Practice Drill

Verbal Reasoning

- Reading Compprehension – Techniques and Practice questions, Solved Practice Drill.

Vocabulary

- **Vocabulary** to memorize (This vocabulary will be used in solving verbal questions in the next module)

ANALYTICAL REASONING

DEALING SEQUENTIAL QUESTIONS

Sequential questions do not order elements in space. Sequential questions can be classified according to the criteria used to order the elements:

- Chronological (before, after, etc.)
- Quantifiable (size, height, etc.)
- Ranking (first, second, etc.)

Chronological Questions

Chronological questions order elements in a time-sequence. For example, James was born before George who was born before Kim who was born before Sara. In the line-up questions that we studied earlier, the elements were ordered spatially. In chronological ordering questions, the elements are ordered sequentially. This is true of many of the questions that we will study in this chapter. Because these questions are sequential in nature, their diagrams can be quite different from those used to solve spatial and hybrid questions.

One of the most common and efficient types of diagrams is the flow chart. In these diagrams the elements are connected by arrows.

Now that we have a second way to diagram linear ordering questions, we need, of course, some means of deciding which method to use.

In general, a Question with no fixed elements should be solved using a flow chart.

In constructing a flow chart, follow these guidelines:

1. Look for a condition that starts the "flow".

2. Build the chart around the element that occurs in the greatest number of conditions.

3. Keep the chart flexible; it will probably have to evolve with the changing conditions.

An example will illustrate the flow chart method of diagramming:

Example

Eight people - S, T, U, V, W, X, Y, Z - were each born in a different year, 1971 through 1978.

The following is known about their ages.

W is older than V.

S is younger than both Y and V.

T is not younger than Y.

Z is younger than Y, but older than U.

1. Which one of the following is a possible sequence of births from first to last?

   A. W V T Y Z U X S

   B. W V T U Y Z X S

   C. U T Y W V S Z X

   D. T W Y S Z U X V

   E. T Y W V S U X Z

2. If S was born in 1975, which one of the following must be false?

   A. V was born in 1973.

   B. V was born in 1972.

   C. Z was born in 1977.

   D. Y was born in 1974.

   E. Z was born in 1974.

3. If S was born in 1976 and X was born in 1973, then the year of birth of exactly how many other people can be determined?

   A. 0 B. 1

   C. 2 D. 3

   E. 4

SOLUTION

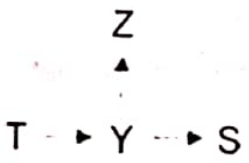
This question does not have any fixed elements (such as T was born in 1972), so the flow chart method is

indicated. We'll use an arrow to indicate that one person is older than another. The condition *"W is older than V"* is naturally symbolized as **W→V**. The other conditions are symbolized in like manner, giving the following schematic:

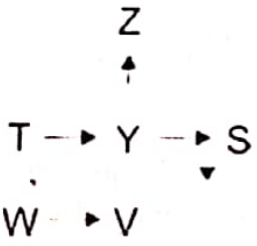
1. W→V
2. Y→S
3. V→S
4. T→Y
5. Y→Z
6. Z→U

Now we construct the diagram. Following the guidelines discussed earlier, look for the element that occurs in the greatest number of conditions. It is Y, so we build the chart around Y. Start with condition 4:

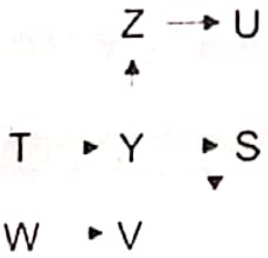
T→Y



Adding conditions 1 and 3 gives



Finally, adding condition 6 gives



X is wild

Two properties of the diagram should be noted before turning to the questions. First, if two elements

are in different rows and no sequence of arrows connects them, then the diagram does not tell us which one is older. For example, since W and Y are in different rows and are not connected by a sequence of arrows, the diagram does not tell us who is older. However, the diagram *does* tell us that T is older than U, because the arrows "flow" from T to Y to Z to U. Second, the diagram tells us that only T, W, or X can be the oldest, and likewise that only U, S, or X can be the youngest.

Q 1.

Which one of the following is a possible sequence of births from first to last?

(A) W V T Y Z U X S

(B) W V T U Y Z X S

(C) U T Y W V S Z X

(D) T W Y S Z U X V

(E) T Y W V S U X Z

This is a straightforward elimination problem. (B) and (E) are not possible sequences because the diagram shows that Z must be older than U. (C) is not a possible sequence because the diagram shows that T must be older than U. The arrows "flow" from T to Y to Z to U. Finally, (D) is not a possible sequence because the diagram shows that V must be older than S. Hence, by process of elimination, the answer is (A).

Q2.

If S was born in 1975, which one of the following must be false?

(A) V was born in 1973.

(B) V was born in 1972.

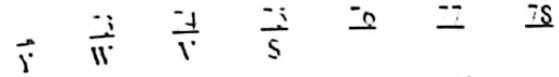
(C) Z was born in 1977.

(D) Y was born in 1974.

(E) Z was born in 1974.

The diagram shows that T, Y, W, and V—not necessarily in that order—were all born before S. So they

must have been born in the years '71 through '74. This gives the following *possible* diagram. (Because one of the births, S, is fixed, it is now more convenient to use a *line-up* diagram.)



Clearly, this diagram shows that Z must have been born after '75. Choice (E), therefore, makes the necessarily false statement. The answer is (E).

Q3.

If S was born in 1976 and X was born in 1973, then the year of birth of exactly how

many other people can be determined?

(A) 0

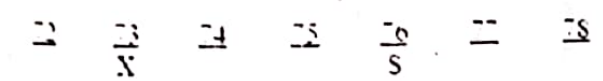
(B) 1

(C) 2

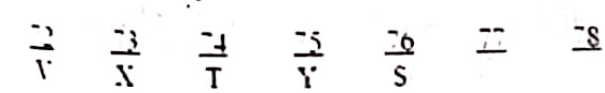
(D) 3

(E) 4

Since two births—S and X—are fixed, we again



revert to a *line-up* diagram:



The original diagram shows that W, V, T, and Y were all born before S, so they must be placed to the left of S on the new diagram. However, we cannot uniquely determine their positions: W and V could have been born in '71 and '72, respectively, or T and Y could have been. So one *possible* diagram is

71	72	73	74	75	76	77	78
W/T	V/Y	X	W/T	V/Y	S	Z	U

Clearly this diagram forces Z and U to have been born in the years '77 and '78, respectively. Hence only

two other births can be determined. The answer is (C).

Topic Drill

Question 1 to 6 are based on following statement

A groovy fence painter takes a day off from work to paint the fence outside of his house. His attention

span is minimal, so we are unable to determine how many planks of his fence he will paint today.

However, he will paint each plank red, blue, white, green, purple, or orange.

The color that he chooses for each plank will be determined by the following constraints:

Every fifth plank painted will be blue.

If two adjacent planks are of the same color, then they are both red.

No blue plank can be adjacent to a green plank.

Every white plank must be adjacent to a red plank and a blue plank.

If an orange plank is next to a green plank, then the pair is bordered by two blue planks.

1. Which of the following could be an order of colors the planks are painted, from first to last?
   A. green, red, red, red, blue, green, orange, blue.
   B. red, white, blue, red, blue, blue, purple, blue.
   C. red, blue, orange, purple, blue, white, red.
   D. orange, purple, blue, red, blue, white, red, orange, red, red.
   E. None of the above.

2. If a white plank is painted fourth, then which of the following could be the colors of a pair of planks that are painted second and third, respectively?
   A. orange, blue. B. purple, green.
   C. white, orange. D. green, red.
   E. None of the above

3. If the painter paints ten planks and the fourth plank is white and the sixth and seventh planks are orange and purple, respectively, then which is another plank that could be white?
   A. first B. second
   C. eighth D. fifth
   E. None of the above

4. If the painter paints five planks and the third and fourth planks are orange and purple, respectively, then which of the following could be the color of the second plank?
   A. orange B. white
   C. green D. purple
   E. None of the above

5. If the painter paints seven planks, then which of the following could be true?
   A. The sixth plank is green.
   B. The third and fourth planks are red.
   C. The fourth plank is blue.
   D. The third plank is blue and the fourth plank is white.
   E. None of the above.

6. If the painter paints ten planks and the sixth and seventh planks are red and green, respectively, then which of the following could NOT be true?
   A. The eighth and ninth planks are both red.
   B. The eighth and ninth planks are purple and orange, respectively.
   C. The eighth and ninth planks are red and white, respectively.
   D. The eighth and ninth planks are purple and red, respectively.
   E. None of the above.

Question 7 to 12 are based on following statement

A kindergarten art teacher is making a tie-dyed T-shirt for her class. Some colors will be added more than once to create cool effects. The colors used are red, green, purple, orange, and yellow.

In order to preserve the artistic nature of the shirt, the colors have to be added in certain orders that are dictated by the following constraints:

Colors can be added more than once in order to create certain effects.

All colors will be added to the shirt at least once.

The same color can be added consecutively in order to create strange effects.

If red is added, then orange is added immediately

before it and yellow is added immediately after it.

Green is not added consecutively with either red or purple.

If yellow is added, then red is added immediately

before it and orange is added immediately after it.

7. If the art teacher adds colors to the shirt six times, then which of the following could be the order in which the colors are added, from first to last?

   A. orange, red, orange, yellow, purple, green.

   B. green, orange, red, yellow, red, purple.

   C. purple, orange, red, yellow, orange, purple

   D. orange, red, yellow, orange, green, purple.

   E. green, orange, red, yellow, orange, purple.

8. What is the least number of times that the teacher could add colors and be able to add all of the colors available?

   A. five B. six

   C. seven D. eight

   E. nine

9. If yellow and orange are added consecutively, then which of the following must be true?

   A. Green is added immediately after orange is added.

   B. Red is added immediately after purple is added.

   C. Orange is added two colors before yellow is added.

   D. Purple is added immediately before orange is added.

   E. Orange is added immediately after orange is added.

10. Which of the following are both colors that can never be used to make consecutive same color additions?

    A. orange, green. B. yellow, purple.

    C. purple, green. D. yellow, red.

    E. red, green.

11. Which color could be added immediately before or after the largest variety of colors?

    A. green B. purple

    C. orange D. red

    E. yellow

12. What is the minimum number of times that colors must be added to the shirt in order to use red exactly five times?

    A. 16 B. 18

    C. 20 D. 23

    E. 25

SOLUTIONS

Hint for explanation question 1 to 6

1. Transcribe the Constraints

Sufficient-Necessary:

Multiple of 5 → B

Sufficient-Necessary:

Consecutive Same Color → RR. This means: ~~OO~~. ~~BB~~. ~~WW~~. and ~~GG~~.

Sufficient-Necessary: W → R W B

Box Rule: B/G

Sufficient-Necessary:

O G → B O G B → O/G

Orange cannot go next to green, because

	that would force green to go next to blue, which would violate the third constraint.
2.	**Draw a Representative Diagram.** It is best to think of this question as one long linear question: _ _ _ _ _ _ _ 1 2 3 4 5 6 7 *Use constraints to gain information.* As of yet, you cannot determine the placement of any variables except for one: _ _ _ BG B BG _ 1 2 3 4 5 6 7
3.	**Make a Hierarchy of Consolidated Constraints** Multiple of 5 → B Consecutive Same Color → RR W → R W B B/G O/G

Q 1.

Which of the following could be an order of colors the planks are painted, from first to last?

(C) This is a possible order.

(A) Green cannot go next to orange or blue.

(B) Blue cannot go consecutively with itself.

(D) The tenth plank must be blue.

(E) **C** is the correct answer.

Q 2.

If a white plank is painted fourth, then which of the following could be the colors of a pair of planks that are painted second and third, respectively?

(D) White must be bordered by red and blue. Since

the fifth plank must be blue, the third plank cannot be

blue, as in answer choice A.

Q 3.

If the painter paints ten planks and the fourth plank is white and the sixth and seventh planks are orange and purple, respectively, then which is another plank that could be white?

_ _ _ W B O P _ _ B
1 2 3 4 5 6 7 8 9 10

...that the second and ninth planks ...no ninth since there

would be room for red to go eighth. White could go second since there would be room for red and blue to border it.

Q 4.

If the painter paints five planks and the third and fourth planks are orange and purple, respectively, then which of the following could be the color of the second plank?

(D) This question boils down to "what could border an orange plank?" Green, orange, and white cannot, so it must be blue, purple, or red.

5.

If the painter paints seven planks, then which of the following could be true?

(B) Both the third and fourth planks could be red.

(A) A green plank cannot border the fifth plank, which is blue.

(C) The fourth plank cannot be blue, because the fifth plank is blue.

(D) White planks must be bordered by red and blue planks.

Q 6.

If the painter paints ten planks and the sixth and seventh planks are red and green,

respectively, then which of the following could NOT be true?

1	2	3	4	5	6	7	8	9	10
				B	R	G	P R		B

(E) All these configurations are possible.

Hint for explanation for question 7 to 12

1. **Transcribe the Constraints**

Pattern: All colors will be added at least once.

Sufficient-Necessary: R → O R Y

Sufficient-Necessary: Y → R Y O

Box Rule: G / P

Notice that you already know that green cannot be added consecutively with red due to the second constraint. Also, you can add the second and third sufficient-necessary boxes to get the following rules:

R → O R Y O

Y → O R Y O

2. **Draw a Representative Diagram.** You can tell a little about the first couple of places in the question due to the box rules for R and Y:

1	2	3	4	5	6	7	8	9	10
RY	Y								

3. **Make a Hierarchy of Consolidated Constraints**

R → O R Y O

Y → O R Y O

G / P

All colors will be added at least once.

Q 7.

If the art teacher adds colors to the shirt six times, then which of the following could be the order in which the colors are added, from first to last?

(E) This could be the order.

(A) Red must be followed by yellow.

(B) Yellow must be followed by orange.

(C) Green must be added.

(D) Green cannot be next to purple.

Q 8.

What is the least number of times that the teacher could add colors and be able to add all of the colors available?

(B) The teacher must add all five colors. If the teacher adds red or yellow, which she must, then she must add orange twice. This makes a total of six color additions as the minimum.

Q 9.

If yellow and orange are added consecutively, then which of the following must be true?

(C) If yellow is added, then the ORYO box is activated, so red must precede yellow and orange must precede red.

Q 10.

Which of the following are both colors that can never be used to make consecutive same-color additions?

(D) Red and yellow cannot be added twice in a row because of the box rule that is invoked whenever one of them is added.

Q 11.

Which color could be added immediately before or after the largest variety of colors?

(C) Orange can go before or after any color.

(A) Green cannot go near purple, red, or yellow.

(B) Purple cannot go near green, red, or yellow.

(D) Red can only go near yellow and orange.

(E) Yellow can go only near red and orange.

Q 12.

What is the minimum number of times that colors must be added to the shirt in order to use red exactly five times?

(B) Every time that red is used, two oranges and a yellow must also be used. However, one addition of orange can be counted for two chains. So the first time red is used four colors are required, but subsequent additions of red require only three colors to be added—RYO. $(1 \times 4) + (4 \times 3) = 16$ additions of colors required for red to be used five times. You must also add the other two colors, green and purple, to make sure that all of the colors are used. $16 + 2 = 18$. Either of these colors can be added in position 1 and the other in position 18 so that they are not added consecutively.

QUANTITATIVE REASONING

AGE PROBLEMS

Problems on ages plays an important role and are often asked in quantitative section of exams HAT.

Basic Concept for problems on ages

1. If the present age of A is x years, then n years ago then the Age of A was (x - n) years and n years after, the Age of A will be (x + n) years.
2. In general, at the starting of the solution we have to assume the present age of one person. It is better to assume the present age = x years.
3. So it is better for you to assume the age of the younger person = x years.
4. If the present ages of A and B are x and y years respectively, then n years ago the Age of A and B were (x - n) and (y - n) years respectively. Similarly, n years after the Age of A and B will be (x + n) and (y + n) years respectively.
5. The age difference between you and your friend is let's suppose 6 years. And after 10 or 15 years this will be same, because clock will run equally for both of you. But, keep in mind that the ratio between you and your friend will not be remained fixed.

Example

Lina got married 8 years ago. Today her age is 9/7 time her age at the time of her marriage. At present her daughter's age is 1/6 of her age. What was her daughter's age 3 years ago?

Solution

Let's assume present age of Lina = x yrs.

Hence, $x = (x - 8) \times 9/7$

$X = 36$ years.

So present age of daughter = $1/6 \times 36 = 6$ years.

3 years ago the age of daughter = 6 - 3 = 3 years.

Topic Drill

1. Father is aged three times more than his son Raju. After 8 years, he would be two and a half times of Raju's age. After further 8 years, how many times would he be of Raju's age?

   A. 2 times B. $2\frac{1}{2}$ times

   C. $2\frac{3}{4}$ times D. 3 times

2. The sum of ages of 5 children born at the intervals of 3 years each is 50 years. What is the age of the youngest child?

   A. 4 years B. 8 years

   C. 10 years D. None of these

3. A father said to his son, "I was as old as you are at the present at the time of your birth". If the father's age is 38 years now, the son's age five years back was:

   A. 14 years B. 19 years

   C. 33 years D. 38 years

4. A is two years older than B who is twice as old as C. If the total of the ages of A, B and C be 27, the how old is B?

   A. 7 B. 8

   C. 9 D. 10

   E. 11

5. Present ages of Sameer and Amjad are in the ratio of 5 : 4 respectively. Three years hence, the ratio of their ages will become 11 : 9 respectively. What is Amjad's present age in years?

   A. 24 B. 27

   C. 40

D. Cannot be determined

E. None of these

6. A man is 24 years older than his son. In two years, his age will be twice the age of his son. The present age of his son is:

A. 14 years B. 18 years

C. 20 years D. 22 years

7. Six years ago, the ratio of the ages of Kami and Sagar was 6 : 5. Four years later, the ratio of their ages will be 11 : 10. What is Sagar's age at present?

A. 16 years

B. 18 years

C. 20 years

D. Cannot be determined

E. None of these

8. The sum of the present ages of a father and his son is 60 years. Six years ago, father's age was five times the age of the son. After 6 years, son's age will be:

A. 12 years B. 14 years

C. 18 years D. 20 years

9. At present, the ratio between the ages of Aamir and Dani is 4 : 3. After 6 years, Aamir's age will be 26 years. What is the age of Dani at present?

A. 12 years B. 15 years

C. 19.5 years D. 21 years

10. Saleem is younger than Rashid by 7 years. If their ages are in the respective ratio of 7 : 9, how old is Saleem?

A. 16 years B. 18 years

C. 28 years D. 24.5 years

E. None of these

SOLUTIONS

1.

Answer: Option A

Let Raju's present age be x years. Then, father's present age = $(x + 3x)$ years = $4x$ years.

$(4x + 8) = \frac{5}{2}(x + 8)$

$8x + 16 = 5x + 40$

$3x = 24$

$x = 8.$

Hence, required ratio = $\frac{4x+16}{x+16} = \frac{48}{24} = 2$

2.

Answer: Option A

Let the ages of children be x, $(x + 3)$, $(x + 6)$, $(x + 9)$ and $(x + 12)$ years.

Then, $x + (x + 3) + (x + 6) + (x + 9) + (x + 12) = 50$

$5x = 20$

$x = 4.$

Age of the youngest child = $x = 4$ years.

3.

Answer: Option A

Let the son's present age be x years. Then, $(38 - x) = x$

$2x = 38.$

$x = 19.$

Son's age 5 years back $(19 - 5) = 14$ years.

4.

Answer: Option D

Let C's age be x years. Then, B's age = 2x years. A's age = $(2x + 2)$ years.

$(2x + 2) + 2x + x = 27$

$5x = 25$

$x = 5.$

Hence, B's age = $2x = 10$ years.

5.

Answer: Option A

Let the present ages of Sameer and Amjad be 5x years and 4x years respectively.

Then, $\frac{5x+3}{4x+3} = \frac{11}{9}$

$9(5x + 3) = 11(4x + 3)$

$45x + 27 = 44x + 33$

$45x - 44x = 33 - 27$

$x = 6.$

Amjad's present age = 4x = 24 years.

6.

Answer: Option D

Let the son's present age be x years. Then, man's present age = (x + 24) years.

$(x + 24) + 2 = 2(x + 2)$

$x + 26 = 2x + 4$

$x = 22$

7.

Answer: Option A

Let the ages of Kami and Sagar 6 years ago be 6x and 5x years respectively.

Then, $\frac{(6x+6)+4}{(5x+6)+4} = \frac{11}{10}$

$10(6x + 10) = 11(5x + 10)$

$5x = 10$

$x = 2$

Sagar's present age = (5x + 6) = 16 years.

8.

Answer: Option D

Let the present ages of son and father be x and (60 -x) years respectively.

Then, $(60 - x) - 6 = 5(x - 6)$

$54 - x = 5x - 30$

$6x = 84$

$x = 14.$

Son's age after 6 years = (x+ 6) = 20 years.

9.

Answer: Option B

Let the present ages of Aamir and Dani be 4x years and 3x years respectively. Then,

$4x + 6 = 26$

$4x = 20$

$x = 5.$

Deepak's age = 3x = 15 years.

10.

Answer: Option D

Let Rashid's age be x years.

Then, Saleem's age = (x - 7) years.

$\frac{x-7}{x} = \frac{7}{9}$

$9x - 63 = 7x$

$2x = 63$

$x = 31.5$

Hence, Saleem's age =(x - 7) = 24.5 years.

SPEED PROBLEMS

Most of the questions on speed can be solved if you know the basic correlation between speed, time and distance which you have learnt in your high school class.

Speed is distance covered by a moving object in unit time.

$$\text{Speed} = \frac{\text{Distance Covered}}{\text{Time taken}}$$

Average Speed

Average speed is always equal to total distance travelled to total time taken to travel that distance.

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$

Relative Speed

- If two objects are moving in same direction with speeds *a* and *b* then their relative speed is |a- b|

- If two objects are moving is opposite direction with speeds *a* and *b* then their relative speed is (a + b)

Topic Drill

1. A train running at the speed of 60 km/hr crosses a pole in 9 seconds. What is the length of the train?
   A. 120 meters B. 180 meters
   C. 324 meters D. 150 meters

2. A train 125 m long passes a man, running at 5 km/hr in the same direction in which the train is going, in 10 seconds. The speed of the train is:
   A. 45 km/hr B. 50 km/hr
   C. 54 km/hr D. 55 km/hr

3. The length of the bridge, which a train 130 meters long and travelling at 45 km/hr can cross in 30 seconds, is:
   A. 200 m B. 225 m
   C. 245 m D. 250 m

4. Two trains running in opposite directions cross a man standing on the platform in 27 seconds and 17 seconds respectively and they cross each other in 23 seconds. The ratio of their speeds is:
   A. 1 : 3 B. 3 : 2
   C. 3 : 4 D. None of these

5. A train passes a station platform in 36 seconds and a man standing on the platform in 20 seconds. If the speed of the train is 54 km/hr, what is the length of the platform?
   A. 120 m B. 240 m
   C. 300 m D. None of these

6. A train 240 m long passes a pole in 24 seconds. How long will it take to pass a platform 650 m long?
   A. 65 seC. B. 89 sec
   C. 100 seC. D. 150 sec

7. Two trains of equal length are running on parallel lines in the same direction at 46 km/hr and 36 km/hr. The faster train passes the slower train in 36 seconds. The length of each train is:
   A. 50 m B. 72 m
   C. 80 m D. 82 m

8. A train 360 m long is running at a speed of 45 km/hr. In what time will it pass a bridge 140 m long?
   A. 40 seC. B. 42 sec
   C. 45 seC. D. 48 sec

9. Two trains are moving in opposite directions @ 60 km/hr and 90 km/hr. Their lengths are 1.10 km and 0.9 km respectively. The time taken by the slower train to cross the faster train in seconds is:
   A. 36 B. 45
   C. 48 D. 49

10. A jogger running at 9 kmph alongside a railway track in 240 metres ahead of the engine of a 120 metres long train running at 45 kmph in the same direction. In how much time will the train pass the jogger?
    A. 3.6 seC. B. 18 sec
    C. 36 seC. D. 72 sec

SOLUTIONS

1.

Answer: Option D

Speed= $\left(60 \times \frac{15}{18}\right) m/\sec = \left(\frac{50}{3}\right) m/\sec$

Length of the train = (Speed x Time).

Length of the train = $\left(\frac{50}{3} \times 9\right)$m = 150m

2.

Answer: Option B

Speed of the train relative to man = $\left(\frac{125}{10}\right)$ m/sec

= $\left(\frac{25}{2}\right)$ m/sec

= $\left(\frac{25}{2} \times \frac{18}{5}\right)$

= 45 km/hr.

Let the speed of the train be x km/hr. Then, relative speed = (x - 5) km/hr.

x - 5 = 45

x = 50 km/hr.

3.

Answer: Option C

Speed = $\left(45 \times \frac{5}{18}\right)$m/sec = $\left(\frac{25}{2}\right)$m/sec

Time = 30 sec.

Let the length of bridge be x meters.

Then, $\frac{130+x}{30} = \frac{25}{2}$

2(130 + x) = 750

x = 245 m.

4.

Answer: Option B

Let the speeds of the two trains be x m/sec and y m/sec respectively.

Then, length of the first train = 27x metres,

and length of the second train = 17y metres.

$$\frac{27x + 17y}{x + y} = 23$$

27x + 17y = 23x + 23y

4x = 6y

$\frac{x}{y} = \frac{3}{2}$

5.

Answer: Option B

Speed = $\left(54 \times \frac{5}{18}\right)$m/sec = 15/sec

Length of the train = (15 x 20)m = 300 m.

Let the length of the platform be x metres.

Then, $\frac{x+300}{36} = 15$

x + 300 = 540

x = 240 m.

6.

Answer: Option B

Speed = $\left(\frac{240}{24}\right)$m/sec = 10m/sec

Required time = $\left(\frac{240+260}{10}\right)$ sec = 89 sec.

7.

Answer: Option A

Let the length of each train be x metres.

Then, distance covered = 2x metres.

Relative speed = (46 - 36) km/hr

= $\left(10 \times \frac{5}{18}\right)$m/sec

= $\frac{25}{9}$m/sec

$\frac{2x}{36} = \frac{25}{9}$

2x = 100

x = 50

8.

Answer: Option A

Formula for converting from km/hr to m/s: X km/hr = $\left(x \times \frac{5}{18}\right)$m/s

Therefore, Speed = $\left(45 \times \frac{5}{18}\right)$m/seC. = $\frac{25}{2}$m/sec.

Total distance to be covered = (360 + 140) m = 500 m.

Formula for finding Time = $\left(\frac{Distance}{Speed}\right)$

Required time = $\left(\frac{500 \times 2}{25}\right)$seC. = 40 sec.

9.

Answer: Option C

Relative speed = (60+ 90) km/hr

= $\left(150 \times \frac{5}{18}\right)$m/sec

= $\left(\frac{125}{318}\right)$m/sec.

Distance covered = (1.10 + 0.9) km = 2 km = 2000 m.

Required time = $\left(2000 \times \frac{3}{125}\right)$sec = 48 sec.

10.

Answer: Option C

Speed of train relative to jogger = (45 - 9) km/hr = 36 km/hr.

=$\left(36 \times \frac{5}{18}\right)$m/sec

= 10 m/sec.

Distance to be covered = (240 + 120) m = 360 m.

Time taken = $\left(\frac{360}{10}\right)$sec= 36 sec.

VERBAL REASONING

READING COMPREHENSION

The most important thing about RC is **understanding** what you read. Being able to read **fast** is also important, but remember that speed is always secondary to understanding. Below are some tips for exam-preparation as well as for general improvement.

Tips

- **Don't rush yourself.** It is natural that you will start a little slowly and then build up speed as you gain familiarity with the passage.
- **Read all the questions first** (if the exam format permits this). This will help you zero in on the relevant portions when you start reading the passage.
- **Read actively.** This means, *try to anticipate the next sentence*. Reading this way will help you engage with the passage more closely.
- **Make notes** to capture the essence of *each paragraph* within the passage. The first sentence of the paragraph usually conveys the main idea or theme of the paragraph.
- **Don't try to memorize anything.** Memorizing consumes time and is not very useful.
- **Get the overview.** After you have read the passage, ask yourself the following questions:
  (1) what is the passage as a whole trying to say?
  (2) How does each paragraph contribute to the broad message of the passage?

Read critically to tackle Reading Comprehension

Reading comprehension is the ability to read and understand unfamiliar materials and to answer questions about them. You will be presented with passages drawn from a variety of subject areas, including humanities, the sciences, latest happenings in society etc. The questions will ask you to analyze what is stated in the passage and to identify underlying assumptions and implications.

Choosing the passages

Among the various passages, you need to select those passages which will be easier for you to answer. Experts suggest factors which you should keep in mind while choosing the RC passages. ***The topic of the passage, whether it is to your liking or not; question patterns, whether they are direct or twisted are some of the important factors. The ratio of the length of the passages and the number of questions is another important factor. A long passage with few questions will pay little dividend in relation to the time one puts in.***

Dealing with long passages

Most of you face the question: How to answer the questions of long passages in a short span of time. If it is a long passage, everyone else will take time. What you need to do is to comprehend it fast, rather than reading it fast. ***'Your focus while reading should be* NOT to READ fast but to COMPREHEND fast.'**.

According to another expert, in order to tackle long passages, practice is the key. '***Try to get more practice in reading, particularly in reading dense materials fast***. Learn to look at each question in the exam from first principles,' he says. He also suggests timing your reading of the passages.

'When you are starting out with your RC preparation, cut out passages, which have a similar style and are more or less of equal length. Determine your reading speed on day

one. Let's say it is 150 words per minute. Read at that speed for some time, say a week or something and after that, stretch yourself by increasing time constraints, say 150 words per 45 seconds, he explains.

Topic Drill

Passage 1 based on question 1 to 5

It happened one day that a fisherman putting out to sea in a boat was just about to cast a net, when right in front of him he saw a man on the point of drowning. Being a stout-hearted and at the same time an agile man, he jumped up and, seizing a boathook, thrust it towards the man's face. It caught him right in the eye and pierced it. The fisherman hauled the man into the boat and made for the shore without casting any of his nets. He had the man carried to his house and given the best possible attention and treatment, until he had got over his ordeal.

For a long time, that man thought about the loss of his eye, considering it a great misfortune. "That wretched fellow put my eye out, but I didn't do him any harm. I'll go and lodge a complaint against him-Why, I'll make things really hot for him!" Accordingly, he went and complained to the magistrate, who fixed a day for the hearing. They both waited till the day came round, and then went to the court. The one who had lost an eye spoke first, as was appropriate. "Gentlemen," he said, "I'm bringing a complaint against this worthy, who, only the other day, savagely struck me with a boathook and knocked my eye out. Now I'm handicapped. Give me justice, that's all I ask. I've nothing more to say." The other promptly spoke up and said, "Gentlemen, I cannot deny that I knocked his eye out, but if what I did was wrong, I'd like to explain how it all happened. This man was in mortal danger in the sea, in fact he was on the point o f drowning. I went to his aid. I won't deny I struck him with my boat hook, but I did it for his own good: I saved his life on that occasion. I don't know what more I can say. For God's sake, give me justice!"

The court was quite at a loss when it came to deciding the right s of the case, but a fool who was present at the time said to them, "Why this hesitation? Let the first speaker be thrown back into the sea on the spot where the other man hit him in the face, and if he can get out again, the defendant shall compensate him for the loss of his eye. That I think fair judgment." Then they all cried out as one man, "You're absolutely right! That's exactly what we'll do!" Judgment was then pronounced to that effect. When the man heard that he was to be thrown into the sea, just where he had endured all that cold water before, he wouldn't have gone back there for the entire world. He released the Goodman from any liability, and his earlier attitude came in for much criticism.

In the light of this incident, you can take it from me that it's a waste of time to help a scoundrel. Release guilty thief from the gallows, and he will never like you for it. A wicked man will never be grateful to anyone who does him a good turn: He'll forget all about it; it will mean nothing to him. On the contrary, he would be only too glad to make trouble for his benefactor if he ever saw him at a disadvantage.

Questions

1. The word cast is used
   A. Tint
   B. Perform
   C. Hurl
   D. Mold
   E. Copy

2. Paragraph 1 makes it clear that the fisherman is
   A. Essentially well-meaning
   B. Clumsy and Foolish.
   C. Fat but nimble
   D. Hard-working and honest.
   E. Basically unlucky

3. The word fixed is used to mean
A. CorrecteD.
B. Secured
C. Set
D. Mended
E. . Attached

4. The word worthy is used to mean
A. Caliber
B. Significance
C. Morality
D. Gentleman
E. Prize

5. Paragraph 3 concerns
A. The narrator's beliefs
B. The court's wishes
C. The one-eyed man's complaint
D. The fisherman's plea
E. The magistrate's judgment

PASSAGE 2

The eastern and western united state differs in many ways, but perhaps the most significant difference between the two regions is climate. The East receives enough rainfall to sustain agriculture, while the West does not receive adequate rainfall to do so .Additionally; there are widely disparate climatic variations within smaller regions in the West than there are in the East. The mountains, the Sierra Nevada's and the Cascades, that impede the Pacific Ocean's ability to cool in the summer and warm in the winter, as well as the fronts that bring moisture in the form of rain and snow, have much to do with the extremes of climate found in the West also affect climate because even the mountainous flatlands have elevations higher than a mile.

Because of these extremes, particularly in the area of rainfall (there can be as much as 150 inches of precipitation annually on the western side of the Sierra-Cascade range as contrasted with as little as four inches annually on the eastern side); irrigation becomes critical if the area is to remain viable for human habitation. Actually, it is so hot in some portions of the western desert that even when rain clouds form, it does not rain because the earth's reflected heat dissipated the moisture before it can reach the ground. Any drops that actually reach the ground quickly evaporate. While the arid Central Plains of the United Stated can use water for irrigation form the Ogallala Aquifer, a closed-basin aquifer, discovered after World War I, the western regions are too far away to benefit from this trapped run-off from several Ice Ages that is confined in gravel beds, stretching from South Dakota to West Texas, No wonder then that water is so precious to the people and farmlands of this are and that the population of this area presses for national, state, and local funding for irrigation projects that will store and reroute water for them.

The Colorado River, with its various tributaries, including, for example, the Gunnison, the Green, and the Gila, has long been the source of most irrigation projects in the desert areas of the West. Much of the water from the Colorado River goes into the state of California to irrigate the Imperial and San Joaquin Valleys. On its route from high in the Rockies to the Gulf of California, the river is diverted in many areas to irrigate fields; the salinity content of the water has increased dramatically. The amount of salt in the water can then have a detrimental effect on the crops if proper drainage systems are not built. Not only is a proper drainage system are not built. Not only is a proper drainage system exorbitantly expensive, but drainage systems also creating a run-off, Which must be handled in some efficient way. By the time the water is drained, this run-off would n not only contain salt, but probably pesticides as well, and the question of what to do with the run-off becomes an issue.

Despite the years of better than average rainfall in the late 70s and early to mid-80s tha even cause the Great Salt Lake in Utah to flood the situation in the western desert areas, particularly California, remains critical, It is no.

uncommon for droughts in the state to last several years. Consequently, water, not only for crops, but for human consumption itself, is at stake. Thus, it becomes a serious mandate to solve the water problem in this area if the area is to survive.

QUESTIONS

1. The world disparate means
   A. Distinct
   B. Different
   C. Unusual
   D. Analogous
   E. Similar

2. According to the passage, one of the mountain ranges that affects rainfall in the West is the
   A. Rockies
   B. Appalachian
   C. Colorado
   D. Blue Ridge
   E. Sierra Nevadas

3. According to the passage, another factor influencing climate in the West is
   A. Desert plants
   B. The Pacific Ocean
   C. Elevation
   D. The Colorado River
   E. Plateaus

4. According to the passage, what has become critical on the eastern side of the Sierra-Cascade range?
   A. Crop rotation
   B. Truck farming
   C. Crop dusting
   D. The Colorado River
   E. Drainage

5. In some areas of the arid western desert,. The formation of rain clouds doesn't assure rain because
   A. Earth's reflected heat dissipated moisture
   B. Mountains are too high
   C. Desert winds blow clouds away
   D. Plateaus are too dry
   E. Riverbeds are too deep

Passage 03

The Library of Congress is the world's largest and most open library. With collections numbering more than 97 million items, it include materials in 460 languages; the basic manuscript collections of 23 Presidents of the United States; maps and atlases that have aided explorers and navigators in charting both the world outer space; and the earliest motion pictures and examples of recorded sound, as well as the latest databases and software packages. The Library's services extend not only to members and committees of Congress, but to the executive and judicial branches of government, to libraries throughout the nation and the world, and to scholars, researchers, artists, and scientists who use its resources.

This was not always the case. When President John Adams signed the bill that provided for the removal of the seat of government to the new capital city of Washington in 1800, he created a reference library for Congress only. The bill provided, among other items, $5,000 "for the purchase of such books as may be necessary for the use of Congress- and for putting up a suitable apartment for containing them therein ...."

After this small congressional library was destroyed by fire along with the Capitol building in 1814, former President Thomas Jefferson offered therein "...as a replacement his personal library, accumulated over a span of fifty years." It was considered to be one of the finest in the United States. Congress accepted Jefferson's offer. Thus the foundation was laid for great national library.

By the close of the Civil War, the collections of the Library of Congress had grown to 82,000 volumes and were still principally used by members of Congress and committees. In 1864 President Lincoln appointed as Librarian of Congress a man who was to transform the Library: Ainsworth Rand Spofford who opened

the public and greatly expanded its collections. Spofford successfully advocated a change in the copyright law so that the Library would receive two free copies of every book, map, chart, dramatic or musical composition, engraving, cut, print, or photograph submitted for copyright Predictably, Spofford soon filled all the Capitol's library rooms, attics, and hallways. In 1873, he then won another lobbying effort, for anew building to permanently house the nation's growing collection and reading rooms to serve scholars and the reading public. The result was the Thomas Jefferson Building, completed in 1897. Since then, strutted to house the Library's ever-expanding collection.

The first Librarian in the new building was a newspaperman with no previous library experience, John Russell Young. He quickly realized that the Library had to get control of the collections that that been overflowing the rooms in the Capitol. Young set up organizational units and devised programs that changed the Library from essentially an acquisitions operation into and efficient processing factory that organized the materials and made them useful.

Young was succeed after only two years by Herbert Putnam, Formerly head of the Boston Public Library, who served as Librarian Spofford had collected the materials, and Young had organized them, Putnam set out to insure that they would be used. He took the Library of Congress directly into the motional library scenes and made its holdings known and available to the smallest community library in the most distant part of the country.

About 1912, both Librarian Putnam and members of Congress became concerned about the distance that was widening between the Library and its employer, the Congress. Various states had begun to set up "legislative reference bureaus," which brought together skilled teams of librarians, Economists, and political scientists whose purpose was to respond quickly to questions that arose in the legislative process. Congress wanted the same kind of service for itself, so Putman designed such a unit for the Library of Congress. Called the Legislative Reference Service, it went into operation in 1914 to prepare indexes, digests, and compilations of law that the Congress might need, but it quickly became a specialized reference unit for information transfer and research. This service was the forerunner of the Library's current Congressional Research Service.

Questions:

1. By saying that the Library of Congress is "the world's most open library" the author means that
   A. The Library has branches all over the world.
   B. Anyone who wants to can use any of the resource of the Library.
   C. The Library maintains hours from very early in the morning to very late at night.
   D. The Library's services are available to a wide verity of institutions and individuals.
   E. The Thomas Jefferson Building contains several reading rooms for public use.

2. Which of the following kind of materials is NOT mentioned in the passage as being part of the collection of the Library of Congress?
   A. Computer software
   B. Every book published in English
   C. Musical recordings
   D. Congressional research
   E. Every photograph copyrighted in the United States

3. Thomas Jefferson's donation of his personal library to congress can be seen as

A. An attempt to outdo John Adams.
B. An indication of Jefferson's disenchantment with the library.
C. A well-meant but inadequate effort to replace what had been lost.
D. The largest single contribution by an individual to the Library of Congress.
E. The foundation from which the present Library of Congress grew.

4. Which of the following made the collections of the Library of Congress available to the public?
A. Thomas Jefferson
B. Anis worth Rand Spofford
C. John Adams
D Herbert Putnam
E. John Russell Young

5. Ainsworth Rand Spofford wanted to build a new building for the Library of Congress because
A. His efforts to expand the collection were so successful that there was no longer room for it in the Capitol.
B. He wanted to leave a lasting legacy of his tenure as Librarian of Congress.
C. Housing the collection in the Capital building made the library inaccessible to the public.
D. There were no reading rooms in the Capitol.
E. There was an overwhelming request from the populace for such a building.

SOLUTIONS

Q1.

The correct answer is (C). It is used in relation to nets, so the only appropriate synonym for cast is hurl, Choice (C)

Q2.

The correct answer is (A). The fisherman may be choice (D), but that is never made clear. He is certainly not choice (B), and he is stout-hearted, not stout, choice (C), There is no support for choice (E). The only answer possible is choice (A), and, in fact, the narrator makes it clear that the fisherman has done everything possible to help the fisherman has done everything possible to help the drowning man.

Q3.

The Correct answer is (C), Fixed has many meanings, and each choice is a possible synonym. However, in the context of "[fixing]" a day for the hearing," only choice (C) makes sense.

Q4.

The correct answer is (D). This archaic term means "man of worth," or gentleman. Testing the choices in context should lead you to his conclusion.

Q 5.

The correct answer is (D). All of paragraph 3 is given over to the fisherman's tale of what happened

Q 6.

The correct answer is (B). The context of the sentence, particularly the use of the word variations, supports choice (B).

Q 7.

The correct answer is (E). The two mountain ranges mentioned in the passage are Sierra Nevadas and the Cascades.

Q 8.

The correct answer is (C). While the Pacific Ocean, choice (B), is mentioned as a potential

source of moisture for the area, elevation is the critical factor influencing climate.

Q 9.

The correct answer is (D). Because of the virtual absence of rainfall on the eastern side, irrigation, choice (D), is critical.

Q 10.

The correct answer is (A). The passage specifically states that moisture is dissipated by the earth's heat.

Q 11.

The correct answer is (D). In the last sentence of the first paragraph, the author explains what is meant by an "open library" by describing who can use the Library of Congress's resources

Q 12.

The correct answer is (B). Computer soft wear is mentioned musical recordings combined with, Congressional research and copyright photographs. Every book copyrighted in the United States is put into the Library's collection, but many books published in English are not copyrighted in the United States.

Q 13.

The correct answer is (E). This answer uses a different metaphor to say what the author says. "Thus the foundation was laid for a great national library"

Q 14.

The correct answer is (B). See line, para 4.

Q 15.

The correct answer is (A). This answer can be inferred form lines which say that Spofford "greatly expanded [the Library's] collections," and lines which say that all the Capitol's space had been filled.

VOCABULARY

Following is a list of English words with meaning. You are advised to memorize all these words. All these words will be used in the Verbal section in the next module.

Word	Common Meaning
Assumption	A thing that is accepted as true or as certain to happen, without proof.
Discrepancy	An illogical or surprising lack of compatibility or similarity between two or more facts.
Entrepreneurial	Characterized by the taking of financial risks in the hope of profit; enterprising.
Isosceles	(of a triangle) having two sides of equal length.
Redistribution	The distribution of something in a different way, typically to achieve greater social equality.
Restatement	An act of stating something again or differently, especially more clearly or convincingly.
Subordinating	Treat or regard as of lesser importance than something else.
Termination	The action of terminating something or the fact of being terminated.

MODULE || 07

Analytical Reasoning

- Terminologies and Techniques with solved examples and Practice Drill

Quantitative Reasoning

- Geometry
- Solved Practice Drill

Verbal Reasoning

- English Grammar – Techniques and Practice questions, Solved Practice Drill.

Vocabulary

- Vocabulary to memorize (This vocabulary will be used in solving verbal questions in the next module)

ANALYTICAL REASONING

LOGICAL REASONING

A logical reasoning test is a fundamental part of any assessment. Logical reasoning generally does not require verbal or numerical reasoning although variations exist that do. It is rather a technical section of the test. Before dealing with this type of questions you must know the basic terminologies.

Assumptions

- An assumption is merely an unstated (implied) premise.
- In logically correct arguments which contain an assumption, the premise + assumption = conclusion.
- An assumption bridges the gap between argument's stated premises and conclusion.

- Remember, since the assumption is an UNSTATED premise, any answer choice that comes from the passage to support your assumption is necessarily incorrect.

- For assumption questions, find the conclusion and determine which answer choice needs to be true for a conclusion to be valid. (It must be a statement that completely supports the conclusion)

CORRECT ANSWER CHOICES

- Will be supporter or defender
- Supporters help to link unrelated information presented in the stimulus and fill logical gaps
- Defenders eliminate possibilities of weakness and attack to the stimulus/conclusion.

Strengthen the Argument

Identify the conclusion—this is what you are trying to strengthen!
Find the logical gap and fix it with additional information. This is the ONLY type of GMAT question where additional information (outside of the question) can/should be used.

Correct answers to this question type will:
- Connect evidence with conclusion better
- Make conclusion stronger
- Strengthen the evidence with new information (perhaps an assumption is needed to make the argument work)

Weaken The Argument

To solve these questions, you first need to identify the premise and the conclusion. In this question type, we assume an answer choice presented to be true – even if it introduces new information (obviously, the information has to be relevant to the stimulus)

ANSWER CHOICE QUALIFICATION:
- should rebuke the conclusion of the stimulus
- Answer choices are taken to be true, even if there is new information provided.
- Will either break down causality or show an obvious error in reasoning in formation of the conclusion

CORRECT ANSWER CHOICES:
- Will point out an obvious reason for the illogical conclusion
- Enumerate a wrong generalization
- Point out improper comparisons between two scenarios that the author assumed

MUST BE TRUE/ INFERENCE/ MAIN POINT/CONCLUSION

Consider the evidence, draw a conclusion.
An inference is an extension of an argument, not a necessary part of it.
A valid inference is a conclusion, but not necessarily the conclusion, of a set of statements.

For inference questions, determine which answer choice must absolutely, positively be true based on what you've read.
- Pick the obvious answer choice.
- Avoid extreme answers (too strong or too weak)

CORRECT ANSWER CHOICES:
- Restatement of the conclusion
- Combination of one or more premises
- Should be the main point of the stimulus, not just a premise (for Main Point questions-Repeat premises are wrong)

Resolve the Paradox

To solve this type of question, look for a logically contradictory discrepancy.
- Often the correct answer will take a similar format (in terms of answer length or argument structure).

Evaluate the Argument

The question stem will likely use some form of the word "evaluate," "determine," or "useful / important to know."

-Find the conclusion and identify the main supporting premise. If you can articulate any gaps between the main premise and the conclusion, do so. Think of the conclusion as the author's hypothesis; your job is to find the answer choice that can test that hypothesis. The answers will provide a "whether or not" type of statement, indicating information that might or might not be so. The correct answer will be able to both slightly strengthen and slightly weaken the hypothesis, depending upon whether the information in that choice is true or is not true.

-Know what you're not trying to do as well. We're not trying to strengthen the conclusion or make it more likely that the author's hypothesis is correct.

PRINCIPLES OF LOGICAL REASONING

Inference VS Assumption

An inference is a conclusion that can be drawn based on one or more of the statements in the stimulus. An inference must be true based on something that you read.

An assumption is a missing but necessary piece of evidence. An assumption is something that must be true in order for the argument to be complete

Numbers, Percentages

Watch for the distinction between NUMBERS and PERCENTAGES.

Mimic the Reasoning

Follow same line of reasoning from the passage in the answer.

Eliminate the question stem detail to create a shorthand version of the argument structure.
- Question Stem: If it rains, then I will stay at home today."
- Shorthand: If A, then B."
- Answer: "If A, then B."

7 Principles of LR

1. Understand structure of argument. Identify premise (P), conclusion (C) and any unstated assumptions. Look for structural signpost words which mark P and C.
2. Preview question before reading passage.
3. Paraphrase passage's point or main idea using one verb "i.e., explain, criticize, compare, contrast".3
4. Judge argument's persuasiveness while reading actively.
5. Answer question being asked.
6. Paraphrase answer.

7. Keep SCOPE in mind. Moderate rather than strong words / qualifiers usually correct.

Paraphrasing and Pre phrasing Paraphrasing

• Actively translate passages into your own words.
• Pretend you are explaining the information in a passage to a 10-year-old kid.

Pre phrasing

• Think about what form the correct answer will take.
• As you do more questions, you will begin to "guess" correctly, as you start to think as the test makers do.

Irrelevant

Watch for irrelevant or overly strong answer choices in CR.
Stay within SCOPE and TONE of passage

Negate (Counterattack)

For assumption questions, negate CR answer choice to see if the conclusion can survive

Statistics

When an argument is based on statistics, it is usually assumed that the people polled are representative of the whole

Questions Involving Surveys

Consider: Does the survey accurately represent the views of the whole group surveyed? Is there a statistics bait and switch?

Scope Shifts

Be wary of scope shifts. Look for test makers' tricks:
• Sometimes a passage will begin with one group and draw a conclusion about another group. Similarly, a passage might have weak premises and then draw an overbroad conclusion.
• Other times the tone of the passage moves so far that the test taker is left wondering, "How did that conclusion come about?"

Topic Drill

Directions

Read the paragraph carefully and determine the main point the author is trying to make. What conclusion can be drawn from the argument?

Five statements follow each paragraph. One statement supports the author's argument better than the others do.

1. One New York publisher has estimated that 50,000 to 60,000 people in the United States want an anthology that includes the complete works of William Shakespeare. And what accounts for this renewed interest in Shakespeare? As scholars point out, his psychological insights into both male and female characters are amazing even today. This paragraph best supports the statement that
   A. Shakespeare's characters are more interesting than fictional characters today.
   B. People even today are interested in Shakespeare's work because of the characters.
   C. Academic scholars are putting together an anthology of Shakespeare's work.
   D. New Yorkers have a renewed interested in the work of Shakespeare.
   E. Shakespeare was a psychiatrist as well as a playwright.

2. One of the warmest winters on record has put consumers in the mood to spend money. Spending is likely to be the strongest in thirteen years. During the month of February, sales of existing single-family homes hit an annual record rate of 4.75 million.
This paragraph best supports the statement that
   A. Consumer spending will be higher thirteen years from now than it is today.
   B. More people buy houses in the month of February than in any other month.
   C. During the winter months, the prices of single-family homes are the lowest.
   D. There were about 4 million homes for sale during the month of February.
   E. Warm winter weather is likely to affect the rate of home sales.

3. Generation Xers are those people born roughly between 1965 and 1981. As employees, Generation Xers tend to be more challenged when they can carry out tasks independently. This makes Generation Xers the most entrepreneurial generation in history.
This paragraph best supports the statement that Generation Xers
   A. Work harder than people from other generations.
   B. have a tendency to be self-directed workers
   C. have an interest in making history
   D. Tend to work in jobs that require risk-taking behavior.
   E. Like to challenge their bosses work attitudes.

4. If you're a fitness walker, there is no need for a commute to a health club. Your neighborhood can be your health club. You don't need a lot of fancy equipment to get a good workout either. All you need is a well-designed pair of athletic shoes.
This paragraph best supports the statement that
   A. fitness walking is a better form of exercise than weight lifting.
   B. a membership in a health club is a poor investment.
   C. walking outdoors provides a better workout than walking indoors.
   D. fitness walking is a convenient and valuable form of exercise.
   E. poorly designed athletic shoes can cause major foot injuries.

5. In the past, consumers would rarely walk into an ice cream store and order low-fat ice cream. But that isn't the case today. An increasing health consciousness combined with a much bigger selection of tasty low-fat foods in all categories has made low-fat ice cream a very profitable item for ice cream store owners.
This paragraph best supports the statement that
   A. low-fat ice cream produces more revenue than other low-fat foods.
   B. ice cream store owners would be better off carrying only low-fat ice cream.
   C. ice cream store owners no longer think that low-fat ice cream is an unpopular item.
   D. low-fat ice cream is more popular than other kinds of ice cream.
   E. consumers are fickle and it is impossible to please them

6. Today's high school students spend too much time thinking about trivial and distracting matters such as fashion. Additionally, they often dress inappropriately on school grounds. Rather than spending time writing another detailed dress policy, we should make

school uniforms mandatory. If students were required to wear uniforms, it would increase a sense of community and harmony in our schools and it would instill a sense of discipline in our students. Another positive effect would be that teachers and administrators would no longer have to act as clothing police, freeing them up to focus on more important issues.
This paragraph best supports the statement than

A. inappropriate clothing leads to failing grades.
B. students who wear school uniforms get into better colleges.
C. teachers and administrators spend at least 25% of their time enforcing the dress code.
D. students are not interested in being part of a community
E. school uniforms should be compulsory for high school students.

7. The criminal justice system needs to change. The system could be more just if it allowed victims the opportunity to confront the person who has harmed them. Also, mediation between victims and their offenders would give the offenders a chance to apologize for the harm they have done.
This paragraph best supports the statement that victims of a crime should

A. learn to forgive their offenders.
B. have the right to confront their offenders.
C. learn the art of mediation.
D. insist that their offenders be punished.
E. have the right to impose a sentence on their offenders.

8 A few states in this country are considering legislation that would prohibit schools from using calculators before the sixth grade. Other states take a different position. Some states are insisting on the purchase of graphing calculators for every student in middle school.
This paragraph best supports the statement that in this country

A. there are at least two opinions about the use of calculators in schools.
B. calculators are frequently a detriment to learning math.
C. state legislators are more involved in education than ever before.
D. the price of graphing calculators is less when schools buy in bulk.
E. the argument against calculators in schools is unfounded.

9. Today's workforce has a new set of social values. Ten years ago, a manager who was offered a promotion in a distant city would not have questioned the move. Today, a manager in that same situation might choose family happiness instead of career advancement.
This paragraph best supports the statement that

A. most managers are not loyal to the corporations for which they work.
B. businesses today do not understand their employee's needs.
C. employees social values have changed over the past ten years.
D. career advancement is not important to today's business managers.
E. companies should require their employees to accept promotions.

10. It is well known that the world urgently needs adequate distribution of food, so that everyone gets enough. Adequate distribution of medicine is just as urgent. Medical expertise and medical supplies need to be redistributed throughout the

world so that people in emerging nations will have proper medical care.
This paragraph best supports the statement that

A. the majority of the people in the world have never been seen by a doctor.
B. food production in emerging nations has slowed during the past several years.
C. most of the world's doctors are selfish about giving time and money to the poor.
D. the medical-supply industry should step up production of its products.
E. many people who live in emerging nations are not receiving proper medical care

SOLUTIONS:

Q1.

Answer: Option B

The last sentence in the paragraph clearly gives support for the idea that the interest in Shakespeare is due to the development of his characters. Choice A is incorrect because the writer never makes this type of comparison. Choice c is wrong because even though scholars are mentioned in the paragraph, there is no indication that the scholars are compiling the anthology. Choice d is wrong because there is no support to show that most New Yorkers are interested in this work. There is no support for choice e either.

Q2.

Answer: Option E

This is clearly the best answer because the paragraph directly states that warm weather affects consumer's inclination to spend. It furthers states that the sales of single-family homes was at an all-time high. There is no support for choice a or c. Choice b is wrong because even though there were high sales for a particular February, this does not mean that sales are not higher in other months. Choice d presents a misleading figure of 4 million. The paragraph states that the record of 4.75 million was at an annual, not a monthly, rate.

Q3.

Answer: Option B

The support for choice b is given in the second sentence of the paragraph. Generation Xers like to work independently, which means they are self-directed. No support is given for either choice a or choice c. Choice d is not related to the paragraph. Although the paragraph mentions that Generation Xers like to be challenged, it does not say they like to challenge their boss's attitudes; therefore, choice e can be ruled out.

Q4.

Answer: Option D

By stating that fitness walking does not require a commute to a health club, the author stresses the convenience of this form of exercise. The paragraph also states that fitness walking will result in a good workout. Choice a is incorrect because no comparison to weight lifting is made. Choice b may seem like a logical answer, but the paragraph only refers to people who are fitness walkers, so for others, a health club might be a good investment. Choice c is not in the passage. Although choice e seems logical, the paragraph does not indicate that the wrong shoes will produce major injuries.

Q5.

Answer: Option C

This choice is supported as the best answer because the paragraph indicates that low-fat ice cream was once an unpopular item, but now, because consumers are more health conscious and because there is a wider array of tasty low-fat foods, low-fat ice cream is a profitable item for ice cream store owners.

There is no indication that choices a, b, d,or e are true based on the information given.

Q6.

Answer: Option E

The support for choice e is in the third sentence "we should make school uniforms mandatory". There is no evidence provided to support choices a, b, and d. And although we know that teachers and administrators are spending some of their time enforcing dress code, the paragraph does not quantify how much of their time is spent that way, so there is no support for choice c.

Q7.

Answer: Option B

This answer is clearly stated in the first sentence of the paragraph. There is no support in the passage for choices a, d,or e. As for choice c, although mediation is mentioned, the statement does not indicate that victims should be the mediators.

Q8.

Answer: Option A

The paragraph clearly states that there are two differing opinions with regard to the use of calculators in the classroom. Although some people may believe that choice b is true, the paragraph does not indicate this. Choice c has no relation to the paragraph. Choice d makes logical sense, but the paragraph says nothing about cost. Choice e is an opinion that is not given in the paragraph.

Q9.

Answer: Option C

A change in employee social values over the past ten years is implied in the whole paragraph, but particularly in the first sentence. Choice a is incorrect because the loyalty of the managers to their corporations is never discussed. There is no support for choice b. In choice d, perhaps career advancement is less important than it once was, but the paragraph does not indicate that advancement is unimportant to managers. Choice e is an opinion that is not supported.

Q10.

Answer: Option E

This answer is implied by the statement that redistribution is needed so that people in emerging nations can have proper medical care. Choices a, b, and c are not mentioned in the passage. Choice d is also incorrect the passage indicates that the distribution of medicine, not its production, is inadequate.

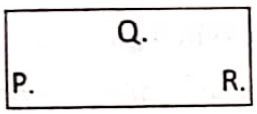
QUANTITATIVE REASONING

GEOMETRY

The fundamental geometrical concepts depend on three basic concepts — point, line and plane. The terms cannot be precisely defined. However, the meanings of these terms are explained through examples.

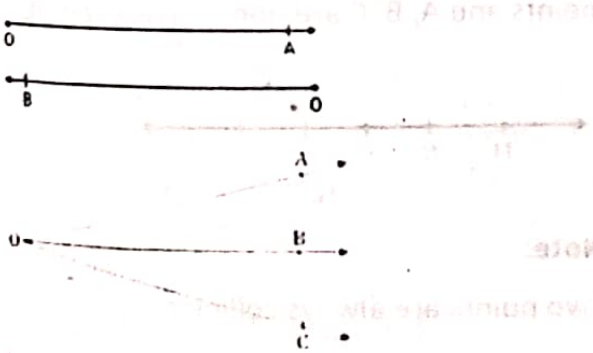
Point:

- It is the mark of position and has an exact location.
- It has no length, breadth or thickness.
- It is denoted by a dot made by the tip of a sharp pencil.
- It is denoted by capital letter.
- In the given figure P, Q, R represents different points.



Line:

- It is a straight path which can be extended indefinitely in both the directions.
- It is shown by two arrowheads in opposite directions.
- It does not have any fixed length.
- It has no endpoints.
- It is denoted as AB $\overleftrightarrow{}$ or BA $\overleftrightarrow{}$ and is read as



line AB or line in the BA.

- It can never be measured.
- Infinite number of points lie on the line.
- Sometimes it is also denoted by small letters of the English alphabet.

Ray:

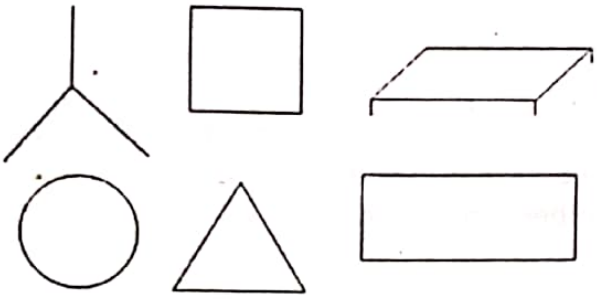
- It is a straight path which can be extended indefinitely in one direction only and the other end is fixed.
- It has no fixed length.
- It has one endpoint called the initial point.
- It cannot be measured.
- It is denoted as OA→ and is read as ray OA.
- A number of rays can be drawn from an initial point O.
- Ray OA and ray OB are different because they are extended in different directions.
- Infinite points lie on the ray.

Line Segment:

- It is a straight path which has a definite length.
- It has two endpoints.
- It is a part of the line.
- It is denoted as AB or BA.
- It is read as line segment AB or line segment BA.
- The distance between A and B is called the length of AB.
- Infinite number of points lies on a line segment.
- Two line segments are said to be equal if they have the same length.

Plane:

A smooth, flat surface gives us an idea of a plane. The surface of the table, wall, blackboard, etc., is smooth and flat. It extends

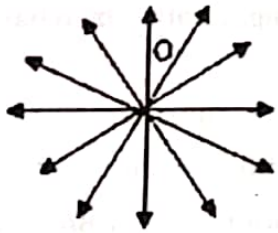


endlessly in all the directions. It has no length, breadth or thickness. Here, we have shown a portion of a particular plane. We can draw certain figures like square, rectangle, triangle, and circle on the plane. Hence, these figures are also called plane figures.

Incidence Properties of Lines in a Plane:

- An infinite number of many lines can be drawn to pass through a given point in a plane.

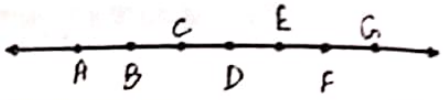
Through a given point in a plane, infinitely many lines can be drawn to pass through.



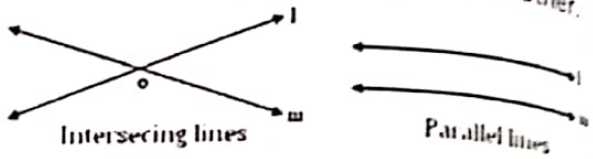
- Two distinct points in a plane determine a unique line.

One and only one line can be drawn to pass through two given points, i.e., two distinct points in a plane. This line lies wholly in the plane.

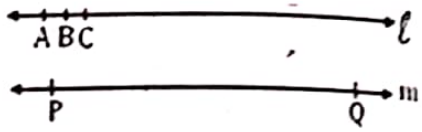
- Infinite number of points lie on the line in a plane.



- Two lines in a plane either intersect at a point or they are parallel to each other.



Collinear Points:



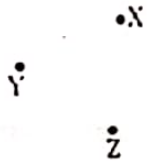
Two or more points which lie on the same line in a plane are called collinear points.

- The line is called the line of collinearity.
- Two points are always collinear.
- In the adjoining figure.....

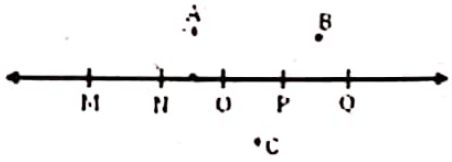
Points A, B, C are collinear lying on line

Points X, Y, Z are not collinear because all the three points do not lie on a line.

Hence, they are called non-collinear points.



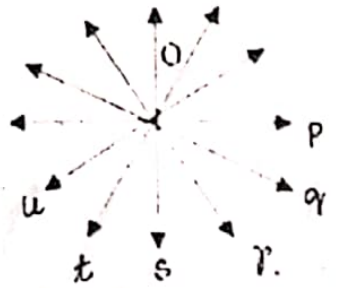
Similarly, here points M, N, O, P, Q are collinear points and A, B, C are non-collinear points.



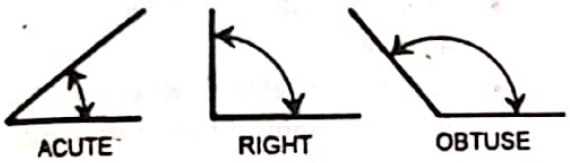
Note:

Two points are always collinear.

Concurrent Lines:

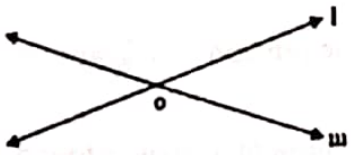


Three or more lines which pass through the same point are called concurrent lines and this common point is called the point of concurrence. In the adjoining figure, lines p, q, r, s, t, u intersect at point O and are called concurrent lines.

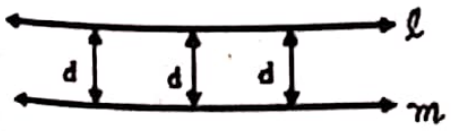


Two lines in a Plane:

Intersecting Lines: Two lines in a plane which cut each other at common point are called intersecting lines and the point is called the point of intersection. In the adjoining figure, lines l and m intersect at point O.

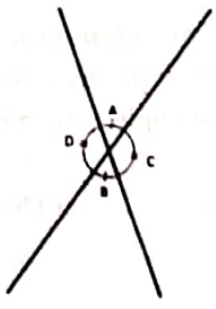


Parallel Lines: Two lines in a plane which do not intersect at any point, i.e., they do not have any point in common are called parallel lines. The distance between the two parallel lines remains the same throughout.



Angles

- An angle is made when two lines intersect at a point. This point is called the vertex of the angle.
- Angles are measured in degrees (°).
- An acute angle is an angle whose degree measure is less than 90°.
- A right angle's degree measure is exactly 90°.
- An obtuse angle's degree measures greater than 90°.
- A straight angle's degree measure is 180°.
- The sum of the measures of angles on a straight line is 180°.
- The sum of the measures of the angles around a point (which make a circle) is 360°.
- Two angles are supplementary if their sums make a straight angle (180°).
- Two angles are complementary if their sums make a right angle (90°).
- Vertical angles are opposite angles formed by two intersecting line segments.
- A line or a segment bisects an angle if it splits the angle into two, smaller equal angles.
- Vertical angles are a pair of opposite angles formed by intersecting line angles. The two angles in a pair of



vertical angles have the same degree measure.

Triangles

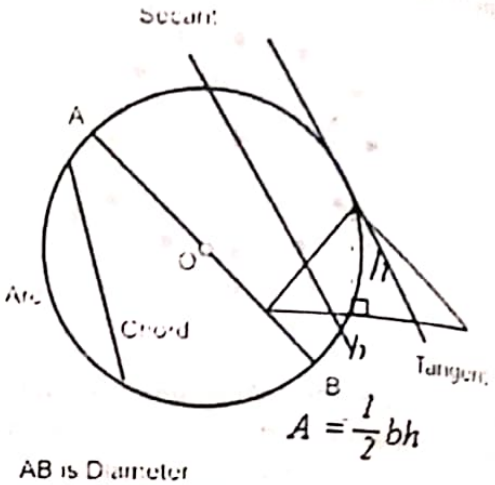
- A triangle is a closed figure with three angles and three straight sides.
- The sum of the interior angles of a triangle is 180°.
- Each interior angle is supplementary to an adjacent exterior angle. Together, they equal 180°.
- The formula for finding the area of a triangle is ½bh. Where b and h are base and height of the triangle respectively.
- An isosceles triangle has two sides of equal length.
- An equilateral triangle has three equal sides and three angles of 60°.
- A right triangle has one 90° interior angle. The side opposite the right angle is called the hypotenuse and it's the longest side of the triangle.
- Pythagorean Theorem for finding side lengths of a right triangle: $a^2+b^2=c^2$
- Two triangles are similar if their corresponding angles have the same degree measure.
- Two triangles are congruent if corresponding angles have the same measure and corresponding sides have the same length.

Circles

- The diameter of a circle is a line segment that connects two points on the circle and passes through the center of the circle.
- The radius is a line segment from the center of the circle to any point on it.
- A circle's central angle is formed by two radii.
- The distance around the circle is called circumference:

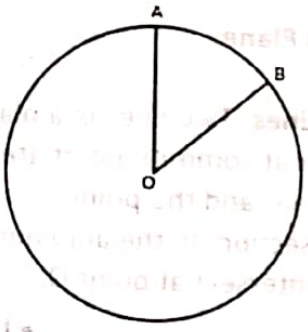
$C = \pi d$

$C = 2\pi r$



AB is Diameter
OA and OB are Radii
Secant: Crosses the circle at two points
Tangent touches the circle at one point

- An arc is a part of the circumference of a circle.
- Length = (n/360) C, where n is the measurement of the central angle of the



circle portion in degrees.

- The area of a circle is found with the formula $A = \pi r^2$.

Topic Drill

1. A chord AB of a circle of radius 5.25 cm makes an angle of 60° at the center of the circle. Find the area of the major segment

A. 168 cm^2 B. 100 cm^2
C. 84 cm^2 D. 70 cm^2

2. If two sides of a right angle triangle are of equal length of 5 cm. What is the length of the side opposite to the right angle?

A. $5\sqrt{2}$ B. $5\sqrt{5}$
C. 5 D. 10

3. How many tiles whose length and breadth are 12 cm and 5 cm respectively will be needed to fit in a rectangular region whose length and breadth are respectively 144 cm and 100 cm

A. 160 B. 240
C. 320 D. 450

4. The perimeter of an equilateral Δ is $73\sqrt{2}$ meters. Find its height

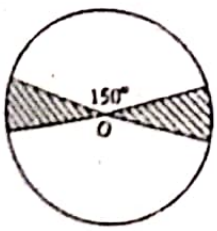
A. 63 meters B. 55 meters
C. 40 meters D. 36 meters

5. Four equal sized maximum circular plates are cut off from a square paper sheet of area 784 cm^2. The circumference of each plate is:

A. 22 cm B. 44 cm
C. 66 cm D. 88 cm

6. What is the sum of exterior angles of a triangle in degree measure?

A. 360 B. 180
C. 90 D. 270



7. If O is the center of the circle above, what fraction of the circular region is shaded?

A. $\frac{1}{12}$ B. $\frac{1}{9}$
C. $\frac{1}{6}$ D. $\frac{1}{3}$

8. Perimeter of a rectangle with base 'b' and height 'h' is measured by

A. 2 × b / h B. 2(h + b)
C. 2(b - h) D. 2(h - b)

9. Sum of all angles around a main point equals to

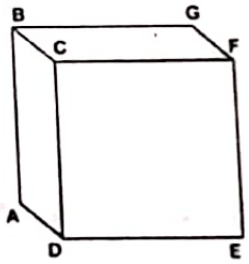
A. 180 B. 360
C. 90 D. 0

10. Length of line joining two points (1, 2) and (4, 8) is:

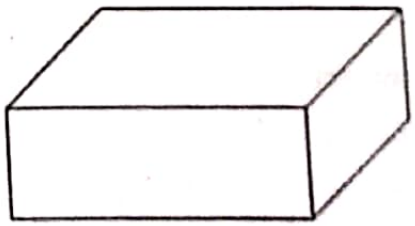
A. $\sqrt{90}$ B. $\sqrt{45}$
C. 12 D. 3

11. How many edges does this shape have?

A. 6 B. 8
C. 12 D. 9



12. In the rectangular solid above, the three sides shown have areas 12, 15, and 20, respectively. What is the volume of the solid?



A. 40 B. 50
C. 60 D. 80

SOLUTIONS

Q1.

Solution:

Option(C) is correct

The given circle is an equilateral triangle

Area of the minor sector

$= \frac{60}{360} \times \pi \times 5.25^2$

$=14.4375\ cm^2$

Area of the triangle

$= \frac{\sqrt{4}}{4} \times 5.25^2$

$=11.93\ cm^2$

Area of the minor segment = Area of the minor sector - Area of the triangle

$=2.5\ cm^2$

Area of the major segment = Area of the circle - Area of the minor segment

$=86.54\ cm^2 - 2.5\ cm^2$

$=84\ cm^2$

Q2.

Option (A) is correct

Apply Pythagoras formula

$5^2 + 5^2 = x^2$

$2 \times 5^2 = x^2$

$x = 5\sqrt{2}$

Q3.

Option (B) is correct

Total area of the region

$=100\times144=100\times144$

$=14400\ cm^2$

Area of one tile

$=12\times5=12\times5$

$=60\ cm^2$

Number of tiles required

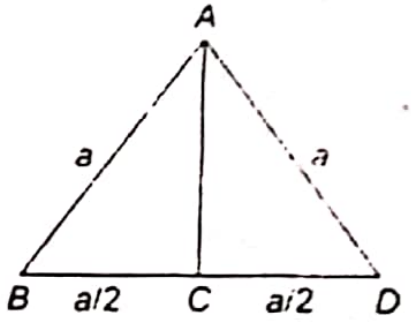
$= \frac{14400}{60}$

$=240$

Therefore, 240 tiles are required.

Q4.

Option (D) is correct



Let one side of the Δ be =a

Perimeter of equilateral Δ=3a

$\Rightarrow 3a=72\sqrt{3}$

$\Rightarrow a=24\sqrt{3}$

Height =AC=AC by Pythagoras theorem

$AC^2=a^2-\left(\frac{a}{2}\right)^2$

$AC^2=a^2\times \left[1-\left(\frac{1}{2}\right)^2\right]$

$AC^2=a^2\times \left[1-\frac{1}{4}\right]$

$AC^2=a^2\times\frac{3}{4}$

Now, putting, $a=24\sqrt{3}$

$\Rightarrow AC^2=24^2\times3\times\frac{3}{4}$

$\Rightarrow AC^2=\frac{24^2\times3^2}{2^2}$

$\Rightarrow AC=\frac{24\times3}{2}$

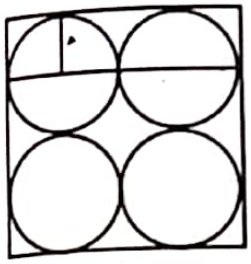
$AC=36$ cm

Q5.

Option (B) is correct

Consider the diagram given below:

radius



Side of square paper

$=\sqrt{784}$ cm $=28$cm

Radius of each circular plate

$=\frac{1}{4}\times 28 = 7$cm

Circumference of each circular plate

$=2\times\frac{22}{7}\times 7$

$=44$ cm

Q6.

Option (A) is correct

Fact

Q7.

Option(C) is correct

Vertical angles are congruent, so $150°+150°=300°$ $150°+150°=300°$ of the circle is not shaded.

Since there are $360°360°$ in a circle, this makes $360°-300°=60°$ of the circle shaded.

The fraction of the circular region that is shaded is thus

$=\frac{60}{360}$

$=\frac{1}{6}$

Q8.

Option (B) is correct

Fact

Q9.

Option (B) is correct

Fact

Q10.

Option (B) is correct

Apply distance formula

$D = \sqrt{(4-1)^2 + (8-2)^2}$

$D = \sqrt{45}$

Q11.

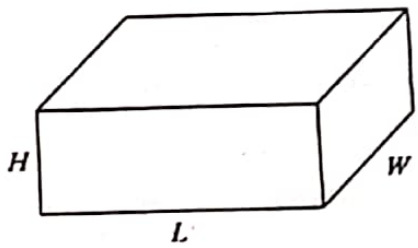
Option(C) is correct

Count the edges.

Q12.

Option(C) is correct

In the figure above,



The areas of the three sides are given by HW, HL, HW, HL, and LWLW.

Assuming HW=12= (3) (4), HL=15= (3) (5) and LW=20= (5) (4),

It is clear that possible choices for the edge lengths are

H = 3, W = 4, and L = 5

Therefore, the volume of the rectangular solid is

= (3) (4) (5)

= 60

VERBAL REASONING

ENGLISH GRAMMAR

Grammar is the system and structure of a language. The rules of grammar help us decide the order we put words in and which form of a word to use.

When you're talking about grammar, it's useful to know some basic terms. The following are called **parts of speech** and they each have their own function.

HAT Grammar Rules

EIGHT PRINCIPAL PARTS OF SPEECH

NOUN

The name of a person, place, or thing.

The cat has sharp claws.

The baby has small fingers.

Cat, claws, and fingers are nouns.

PRONOUN

A word used to refer to a noun, usually used to avoid repetition.

When my sister was hungry, she would scream.

My roommate knew he forgot his keys.

She and he are pronouns.

There are seven categories of pronouns

Demonstrative Pronoun

A pronoun used to identify or point to a noun.

This, That, These, Those.

Those are the best dressers.

Indefinite Pronoun

A pronoun that refers to a nonspecific person or thing.

All, Another, Any, Anybody, Anyone, Both, Each, Either, Everybody, Everyone, Everything, Few, Many, Neither, Nobody, None, No One, Nothing, One, Some, Somebody, Someone, Something.

Anyone who gambles is crazy.

Everybody dance now.

Intensive or Reflexive Pronoun

A pronoun ending in -self, myself, yourself, himself, herself, ourselves, yourselves, themselves. It often names the receiver of an action.

Did you hurt yourself?

She calls herself a singer, but she cannot carry a tune.

Interrogative Pronoun

A pronoun used to begin a question.

Who, Whom, Whose, Which, What.

What happened at work today?

Which film did you see?

Personal Pronoun

Pronouns used to refer to a specific person or thing.

I, Me, You, She, Her, Me, Mine, Your, Yours, Her, Hers, His, Its, Our, Ours, Their, Theirs.

She bores me with her tedious childhood stories.

Theirs is a life of luxury.

Possessive Pronoun

A pronoun used to indicate ownership.

My, Mine, Your, Yours, Her, Hers, His, Its, Our, Ours, Your, Yours, Their, Theirs.

She took a great interest in her career.

Their car is parked too close to ours.

Relative Pronoun

One of the following, when used to introduce an adjective clause.

Who, Whom, Whose, Which, That.

A lie is a remark that always leads to trouble.

She is someone who adores opera.

VERB

A word that expresses action (verb **tenses** treated later).

They went to the store.

Many people do not know how to read.

ADJECTIVE

A word used to modify (describe) a noun or pronoun. Adjectives usually answer one of these questions: Which one? What kind of? How many or how much?

The old dog was barking.

Her sable coat was on the floor.

Adjective: old, sable

ADVERB

A word used to modify a verb, an adjective, or another adverb. Adverbs usually answer the questions: When? Where? How? Why? Under what conditions? To what degree?

This car rides smoothly.

He is an unusually good writer.

She speaks very loudly.

Adverb: smoothly, ususally, lowdly

PREPOSITION

A word placed before a noun to form a phrase modifying (describing) another word in the sentence. The preposition indicates the relationship between the noun and the word the phrase modifies.

about, above, across, after, against, along, among, around, at, before, behind, below, beside, besides, between, beyond, by, down, during, except, for, from, in, inside, into, like, near, next, of, off, on, onto, out, outside, over, past, since, than, though, to, toward, under, unlike, until, up, with, and without.

Let's put our ideas on the table.

Come and sit beside me.

A **prepositional phrase** begins with a preposition which introduces a noun form.

After the movie, we went home.

Besides being lazy, he is a fool.

CONJUNCTION

A joining word.

Correlative Conjunction

A pair of conjunctions connecting grammatically equal elements. Either... or, Neither ... nor, Whether... or, Not only... but also, and both... and.

Either pay me what you owe me or leave.

Whether you pay me now or later is up to you.

Not only does she have a job, but she also tutors on weekends.

Coordinating Conjunction

Connects two words or parts of a sentence. And, Or, But.

It wasn't late, but it was starting to rain.

Give me liberty or death.

Subordinating Conjunction

A word that introduces a subordinate clause and indicates its relation to the rest of the sentence.

After, Although, As, As if, Because, Before, Even Though, If, Since, So That, Than, That, Though,

Unless, Until, When, Where, Whether, and While.

She went into the bank while I waited in the car.

He told me his life story as if he cared.

Reminder: Relative Pronouns (Who, Whom, Whose, Which, and That) also introduce subordinate clauses.

Conjunctive Adverb

An adverb used with a semicolon to connect independent clauses. Consequently, furthermore, however, moreover, nevertheless, then, therefore, and thus.

She swallowed a lot of water; however, the lifeguard got to him quickly.

He had no money; consequently, he moved back home.

ARTICLE

a, an, the (modifies noun); definite article: the book, the tree; indefinite article: a book (could be any book), a tree (could be any tree).

Note: a/an distinction; an is used before a vowel sound.

INTERJECTIONS

A word expressing surprise or emotion. Oh· Hey· Wow· (some grammars include them as parts of speech).

SOME IMPORTANT TERM FOR ANALYZING GRAMMAR AND SYNTAX

Helping Verbs

(Sometimes called "auxiliaries"; models are another, specialized form)

Helping verbs always precede main verbs.

The following words are **helping verbs** when used with a main verb.

Be, Am, Is, Are, Was, Were, Being, Been, Has, Have, Had, Do, Does, Did, Can, Will, Shall, Should, Could, Would, May, Might, Must.

I am singing.

You should think before you speak.

The driver had fallen asleep.

Direct Object

A word or word group that receives the action of the verb.

He read the book.

She threw the ball.

Indirect Object

A noun or pronoun that names to whom or for whom the actions are done.

Fate gives us looks.

My boss threw me a curve (i.e., threw a curve to me).

When the preposition is implied but not stated the indirect object is hidden, as in example above, or.

He gave her the book = He gave the book (to) her.

Modifier

A word, phrase, or clause that describes or qualifies the meaning of a word. Modifiers include adjectives, adverbs, adverbs, prepositional phrases, participial phrases, some infinitive phrases, and adjective and adverb clauses. Problems arise with dangling modifiers where the agent of the action is not clear.

Error: Opening the window to let out a fly, the car swerved into an oncoming car.

Error: After seminary training, women's access to the pulpit has often been denied.

ACTIVE and PASSIVE VOICE

When a verb is in the active voice, the subject of the sentence performs the action. "The

student attended class." In the passive voice, the subject receives the action. "The class was attended by the student." The passive voice can be generally boring, e.g.,

The situation will be taken care of.

A decision was reached.

GERUND

A verb form ending in -ing and used as a noun.

All that laughing made me cry.

Running can be good for you.

PARTICIPLE

A word derived from a verb and having the qualities of both a verb and an adjective; never used as a noun. Present participles end in -ing (I am rushing), past participles in -ed (I was rushed).

SPLIT INFINITIVES

When a modifier appears between its two parts (to/think) "to carefully think," an infinitive is said to be split. If the split infinitive is awkward, move the modifier to another position in the sentence.

Error: The jury was instructed to very carefully review the evidence.

POSITIVE, COMPARATIVE, AND SUPERLATIVE

Most adjectives and adverbs have three forms:

The positive

The comparative

The superlative

Good / better / best; careful, more careful, most careful

CONJUGATION: SUBJECTS JOINED BY AND

Compound subjects joined by "and" are nearly always plural.

Error. Maria's natural ability and her love of music has led her to a singing career.

SUBJECTS JOINED BY OR NOR

With "or" or "nor," make the verb agree with the part of the subject nearer the verb.

Error: If a relative or neighbor are abusing a child, call the police.

MORE ON VERBS

There are three moods in English:

The indicative is used for facts, opinions and questions. (Multan is in Punjab.)

The imperative is used for orders or advice. (Stop talking. Go to class.)

The subjunctive is used for wishes, conditions contrary to fact, and requests or recommendations.

Use the subjunctive mood for wishes and in if clauses expressing conditions contrary to fact. The subjunctive in such cases is the past tense form of the verb; in the case of be, it is always were (not was), even if the subject is singular.

We wish that Kenneth *drove* to school every day (drove is past tense of drive).

If I were a member of President Bush's cabinet [contrary to fact since I am not a member of his cabinet], I would get a new attorney general (were is past tense of was).

Use the subjunctive mode in the clauses following verbs such as ask, insist, recommend, and request. The subjunctive in such cases is the base form of the verb.

Verb tenses in English and many other languages are complex. These are the tenses that you should be prepared to identify:

Simple present: for habitual action in present (She walks to the store.), general, timeless truths (Ice melts quickly in the summer.), the narrative present (Mighty Casey strikes out).

Present progressive: action in progress (He is going to tell her now.), a temporary present activity (I'm studying English at Loyola.), repeated ongoing action (He is always doing that.)

Simple past: a definite completed action (She walked to the store.), a habitual action in the past (He visited his father every day.), a situation in the past now completed (Victoria died in 1901).

Past progressive: an action at a specific point in the past (She was walking to the store at 9 this morning.), past action simultaneous with some past event (He was talking on the phone when the storm struck.), repeated action in the on-going past (Sam was talking all during the lecture.).

Simple future: action in future time (She will go tomorrow.), a future habitual action or future state (You will study harder next year.), a present situation that will obtain in the future with some termination in sight (He will live on campus until he graduates.).

Future progressive: an action that will be in progress at a specific time in the near future (She will be coming home soon.), duration of specific future action (He will be working on the book for years).

Each tense also has a perfect form and a perfect progressive form. Below are the perfect forms:

Present: I have been a teacher for 22 years.

Past: She had already left before I could call her.

Future: By the time he's finished, he will have been doing that ten years.

Topic Drill

Identify the grammatical errors in the following sentences.

1. Before pioneers cleared the land for farms, cities, and road, forests covered about 40 percent of what is now the state of Illinois.
   A. Before B. road
   C. covered D. what

2. The sea chantey, a type of folk music, not only described the pleasures of stations' lives ashore, also but the harsh conditions of life aboard ship.
   A. A type of B. of
   C. also D. abroad

3. Nest building is much less commonly among mammals than among birds.
   A. building B. commonly
   C. than D. birds

4. There is two cars over there.
   A. There B. is
   C. two D. there

5. The Awakening, a novel by Kate Chopin, shocked readers and cause a storm of criticism.
   A. By B. Readers
   C. Cause D. criticism

6. The Alaskan Highway was officially opened November 20, 1942, although much more work needed be done to complete it.
   A. officially B. although
   C. more D. needed be

7. Sagebrush flourishes in the dry soil of the western plains, where other many plants cannot grow
   A. flourishes B. dry

C. other many D. cannot grow

8. Modern directions of Shakespeare are not longer inhibited by earlier traditions of realistic settings.

A. Modern B. not
C. earlier D. realistic settings

9. He was quite amusing when he heard what had happened.

A. was B. amusing
C. heard D. had

10. I decided to climbed to the top of the hill to get a better view.

A. decided B. climbed
C. get D. view

11. He lead me to the rear of the shop where more goods were stacked.

A. lead B. rear
C. goods D. stacked

12. Can you write an article to be include in the next issue of the magazine?

A. Can B. article
C. include D. issue

13. The branch struck him hard and lay him unconscious.

A. The B. struck
C. hard D. lay

14. The dog wagged it's tail when it saw me approaching.

A. wagged B. it's
C. saw D. approaching

15. There were marks on the snow but it were unrecognizable.

A. were B. on
C. it D. unrecognizable

Explanation

1	Correct Answer: B, farms, cities, and forests all are plural so road must be plural (roads)
2	Correct answer is C, Structure: not only... but also
3	Correct answer is B, The comparative of long adjective (common) - ....be less common than....
4	Correct answer is B, should be 'are'
5	Correct answer is C, - Parallel structure: Shocked: simple past tense -> caused must be in simple past tense (caused)
6	Correct answer is D, - Need to do something - Passive voice: needed to be done
7	Correct answer is C, - Many other + countable noun
8	Correct answer is B, - No longer: used when something happened or was true in the past but is not true now
9	Correct answer is B, He was quite **amused** when he heard what had happened.
10	Correct answer is B, I decided to **climb** to the top of the hill to get a better view.
11	Correct answer is A, He **led** me to the rear of the shop where more goods were stacked.
12	Correct answer is C, Can you write an article to be **included** in the next issue of the magazine?
13	Correct answer is D, The branch struck him hard and **laid** him unconscious.
14	Correct answer is B, The dog wagged **its** tail when it saw me approaching.
15	Correct answer is C, There were marks on the snow but **they** were unrecognizable.

VOCABULARY

Following is a list of English words with meaning. You are advised to memorize all these words. All these words will be used in the Verbal section in the next module.

Word	Common Meaning
Caledonia	**Caledonia** is the Latin name given by the romans to the land in today's Scotland north of their province of Britannia.
Concerned	Worried, troubled, or anxious.
Consecutive	Following each other continuously.
Misinterpret	Interpret (something or someone) wrongly.
Placeholders	A significant zero in the decimal representation of a number.
Rediscovered	Discover (something forgotten or ignored) again.
Regardless	Despite the prevailing circumstances.
Upturned	Turn (something) upwards or upside down.

MODULE || 08

Analytical Reasoning

- Solved Review Drill

Quantitative Reasoning

- Functions
- Probability
- Solved Practice Drill

Verbal Reasoning

- English Grammar –Solved Practice Drill.

Vocabulary

- **Vocabulary** to memorize (This vocabulary will be used in solving verbal questions in the next module)

ANALYTICAL REASONING

Section Drill

Directions: Each group of questions in this section is based on a set of conditions. In answering some of the questions, it may be useful to draw a rough diagram. Choose the response that most accurately and completely answers each question.

Questions 1–7

Seven consecutive time slots for a broadcast, numbered in chronological order 1 through 7, will be filled by six song tapes—G, H, L, O, P, S—and exactly one news tape. Each tape is to be assigned to a different time slot, and no tape is longer than any other tape.

The broadcast is subject to the following restrictions:

L must be played immediately before O.

The news tape must be played at some time after L.

There must be exactly two time slots between G and P, regardless of whether G comes before P or whether G comes after P.

1. If G is played second, which one of the following tapes must be played third?
   A. the news
   B. H
   C. L
   D. O
   E. S

2. The news tape can be played in any one of the following time slots EXCEPT the
   A. second
   B. third
   C. fourth
   D. fifth
   E. sixth

3. If H and S are to be scheduled as far from each other as possible, then the first, the second, and the third time slots could be filled, respectively, by
   A. G, H, and L
   B. S, G, and the news
   C. H, G, and L
   D. H, L, and O
   E. L, O, and S

4. If P is played fifth, L must be played
   A. first
   B. second
   C. third
   D. fourth
   E. sixth

5. What is the maximum number of tapes that can separate S from the news?
   A. 1
   B. 2
   C. 3
   D. 4
   E. 5

6. Which one of the following is the latest time slot in which L can be played?
   A. the third
   B. the fourth
   C. the fifth
   D. the sixth
   E. the seventh

7. The time slot in which O must be played is completely determined if G is assigned to which one of the following time slots?
   A. the first
   B. the third
   C. the fourth
   D. the fifth
   E. the sixth

Questions 8-12

Doctor Yasmin works only on Mondays, Tuesdays, Wednesdays, Fridays, and Saturdays. She performs four different activities—lecturing, operating, treating patients, and conducting research. Each working day she

performs exactly one activity in the morning and exactly one activity in the afternoon.

During each week her work schedule must satisfy the following restrictions:

She performs operations on exactly three mornings.

If she operates on Monday, she does not operate on Tuesday.

She lectures in the afternoon on exactly two consecutive calendar days.

She treats patients on exactly one morning and exactly three afternoons.

She conducts research on exactly one morning.

On Saturday she neither lectures nor performs operations.

8. Which one of the following must be a day on which Doctor Yasmin lectures?
   A. Monday
   B. Tuesday
   C. Wednesday
   D. Friday
   E. Saturday

9. On Wednesday Doctor Yasmin could be scheduled to
   A. conduct research in the morning and operate in the afternoon
   B. lecture in the morning and treat patients in the afternoon
   C. operate in the morning and lecture in the afternoon
   D. operate in the morning and conduct research in the afternoon
   E. treat patients in the morning and treat patients in the afternoon

10. Which one of the following statements must be true?
    A. There is one day on which the doctor treats patients both in the morning and in the afternoon.
    B. The doctor conducts research on one of the days on which she lectures
    C. The doctor conducts research on one of the days on which she treats patients.
    D. The doctor lectures on one of the days on which she treats patients
    E. The doctor lectures on one of the days on which she operates

11. If Doctor Yasmin operates on Tuesday, then her schedule for treating patients could be
    A. Monday morning, Monday afternoon, Friday morning, Friday afternoon
    B. Monday morning, Friday afternoon, Saturday morning, Saturday afternoon
    C. Monday afternoon, Wednesday morning, Wednesday afternoon, Saturday afternoon
    D. Wednesday morning, Wednesday afternoon, Friday afternoon, Saturday afternoon
    E. Wednesday afternoon, Friday afternoon, Saturday morning, Saturday afternoon

12. Which one of the following is a pair of days on both of which Doctor Yasmin must treat patients?
    A. Monday and Tuesday
    B. Monday and Saturday
    C. Tuesday and Friday
    D. Tuesday and Saturday
    E. Friday and Saturday

Questions 13–18

Each of seven judges voted for or else against granting Data log Corporation's petition. Each judge is categorized as conservative, moderate, or liberal, and no judge is assigned more than one of those labels. Two judges are conservatives, two are moderates, and three are liberals. **The following is known about how the judges who voted:**

If the two conservatives and at least one liberal voted the same way as each other, then both moderates voted that way.

If the three liberals voted the same way as each other, then no conservative voted that way.

At least two of the judges voted for Data log, and at least two voted against Data log.

At least one conservative voted against Data log.

13. If the two moderates did not vote the same way as each other, then which one of the following could be true?
    A. No conservative and exactly two liberals voted for Data log
    B. Exactly one conservative and exactly one liberal voted for Data log
    C. Exactly one conservative and all three liberals voted for Data log.
    D. Exactly two conservatives and exactly one liberal voted for Data log
    E. Exactly two conservatives and exactly two liberals voted for Data log.

14. Which one of the following must be true?
    A. At least one conservative voted for Data log
    B. At least one liberal voted against Data log
    C. At least one liberal voted for Data log
    D. At least one moderate voted against Data log
    E. At least one moderate voted for Data log

15. If the three liberals all voted the same way as each other, which one of the following must be true?
    A. Both moderates voted for Data log.
    B. Both moderates voted against Data log
    C. One conservative voted for Data log and one conservative voted against Data log.
    D. One moderate voted for Data log and one moderate voted against Data log
    E. All three liberals voted for Data log

16. If exactly two judges voted against Data log, then which one of the following must be true?
    A. Both moderates voted for Data log
    B. Exactly one conservative voted for Data log
    C. No conservative voted for Data log
    D. Exactly two liberals voted for Data log
    E. Exactly three liberals voted for Data log

17. Each of the following could be a complete and accurate list of those judges who voted for Data log EXCEPT
    A. two liberals
    B. one conservative, one liberal
    C. two moderates, three liberals
    D. one conservative, two moderates, two liberals
    E. one conservative, two moderates, three liberals

18. If the two conservatives voted the same way as each other, but the liberals did not all vote the same way as each other, then each of the following must be true EXCEPT
    A. Both conservatives voted against Data log
    B. Both moderates voted for Data log
    C. At least one liberal voted against Data log
    D. Exactly two liberals voted for Data log
    E. Exactly five of the judges voted against Data log.

Logical Reasoning

19. Yoga has become a very popular type of exercise, but it may not be for everyone. Before you sign yourself up for a yoga class, you need to examine what it is you want from your fitness routine. If you're looking for a high-energy, fast-paced aerobic workout, a yoga class might not be your best choice.

This paragraph best supports the statement that

A. yoga is more popular than high-impact aerobics
B. before embarking on a new exercise regimen, you should think about your needs and desires.
C. yoga is changing the world of fitness in major ways
D. yoga benefits your body and mind
E. most people think that yoga is not a rigorous form of exercise.

20. Human technology developed from the first stone tools about two and a half million years ago. At the beginning, the rate of development was slow. Hundreds of thousands of years passed without much change. Today, new technologies are reported daily on television and in newspapers.

This paragraph best supports the statement that

A. stone tools were not really technology
B. stone tools were in use for two and a half million years
C. there is no way to know when stone tools first came into use
D. In today's world, new technologies are constantly being developed
E. none of the latest technologies is as significant as the development of stone tools

SOLUTIONS:

Hint for explanation Questions 1–7

The conditions can be symbolized as follows:

LO
L—>news
G __ __ P

1 2 3 4 5 6 7

Note, G and P in the symbol statement G __ __ P can be interchanged.

1. (A) No. Since G is played second, the condition G __ __ P forces P into space 5:

1 2 3 4 5 6 7
G P

Now, the condition **LO** cannot be placed in spaces 6 and 7 because that would violate the condition

L—>news. Hence, the condition **LO** must be placed in spaces 3 and 4:

1 2 3 4 5 6 7
G L O P

Thus, L must be in space 3. (B) No. Since G is played second, the condition G __ __ P forces P into space 5:

1 2 3 4 5 6 7
G P

	Now, the condition **LO** cannot be placed in spaces 6 and 7 because that would violate the condition **L—>news**. Hence, the condition **LO** must be placed in spaces 3 and 4: 1 2 3 4 5 6 7 _ G L O P _ _ Thus, L must be in space 3. (C) Yes. Since G is played second, the condition **G __ __ P** forces P into space 5: 1 2 3 4 5 6 7 _ G _ _ P _ _ Now, the condition **LO** cannot be placed in spaces 6 and 7 because that would violate the condition **L—>news**. Hence, the condition **LO** must be placed in spaces 3 and 4: 1 2 3 4 5 6 7 _ G L O P _ _ Thus, L must be in space 3. (D) No. Since G is played second, the condition **G __ __ P** forces P into space 5: 1 2 3 4 5 6 7 _ G _ _ P _ _ Now, the condition **LO** cannot be placed in spaces 6 and 7 because that would violate the condition **L—>news**. Hence, the condition **LO** must be placed in spaces 3 and 4: 1 2 3 4 5 6 7 _ G L O P _ _ Thus, L must be in space 3. (E) No. Since G is played second, the condition **G __ __ P** forces P into space 5: 1 2 3 4 5 6 7 _ G _ _ P _ _ Now, the condition **LO** cannot be placed in spaces 6 and 7 because that would violate the condition **L—>news**. Hence, the condition **LO** must be placed in spaces 3 and 4: 1 2 3 4 5 6 7 _ G L O P _ _ Thus, L must be in space 3.
2.	(A) Yes. Place the news in slot 2: 1 2 3 4 5 6 7 _ news _ _ _ _

Now, the condition **L—>news** forces L into slot 1:

1	2	3	4	5	6	7
L	news					

However, this diagram leaves no room for the condition **LO**.

So the news tape cannot be played second.

(B) No. The following valid diagram has the news in slot 3:

1	2	3	4	5	6	7
L	O	news	G	H	S	P

(C) No. The following valid diagram has the news in slot 4:

1	2	3	4	5	6	7
L	O	P	news	H	G	S

(D) No. The following valid diagram has the news in slot 5:

1	2	3	4	5	6	7
G	L	O	P	news	H	S

(E) No. The following valid diagram has the news in slot 6:

1	2	3	4	5	6	7
H	G	L	O	P	news	S

3. (A) No. H and S can be the first and last tapes played, respectively, as the following valid diagram illustrates:

1	2	3	4	5	6	7
H	G	L	O	P	news	S

(B) No. This violates the condition **L—>news**.

(C) Yes. Placing the information on the diagram Yields

1	2	3	4	5	6	7
H	G	L				

The condition **LO** forces O into slot 4, and the condition **G __ __ P** forces P into slot 5:

1	2	3	4	5	6	7
H	G	L	O	P		

To be scheduled as far from H as possible, S must be in slot 7, which forces the news into slot 6:

1	2	3	4	5	6	7
H	G	L	O	P	news	S

This diagram satisfies all the conditions and has H, G, and L in the first, second, and third time slots, respectively.

(D) No. Place the information on the diagram:

1	2	3	4	5	6	7
H	L	O				S

Clearly, there is no room on this diagram to place the condition **G __ __ P.**

(E) No. H and S can be the first and last tapes played, respectively, as the following valid diagram illustrates:

1	2	3	4	5	6	7
H	G	L	O	P	news	S

4.

(A) No. Place the new condition:

1	2	3	4	5	6	7
				P		

Then the condition **G __ __ P** forces G into space 2:

1	2	3	4	5	6	7
	G			P		

The condition **LO** must be placed in positions 3 and 4; in spaces 6 and 7 it would violate the condition **L—>news**. This yields

1	2	3	4	5	6	7
	G	L	O	P		

Hence, L must be played third. Note, this question is essentially identical to **Question 1.** (B) No. Place the new condition:

1	2	3	4	5	6	7
				P		

Then the condition **G __ __ P** forces G into space 2:

1	2	3	4	5	6	7
	G			P		

The condition **LO** must be placed in positions 3 and 4; in spaces 6 and 7 it would violate the condition **L—>news**. This yields

1	2	3	4	5	6	7
	G	L	O	P		

Hence, L must be played third. Note, this question is essentially identical to Question 1

(C) Yes. Place the new condition:

1	2	3	4	5	6	7
				P		

Then the condition **G __ __ P** forces G into space 2:

1	2	3	4	5	6	7
	G			P		

The condition **LO** must be placed in positions 3 and 4; in spaces 6 and 7 it would violate the condition **L—>news**. This yields

1	2	3	4	5	6	7
	G	L	O	P		

Hence, L must be played third. Note, this question is essentially identical to Question 1.

(D) No. Place the new condition:

1	2	3	4	5	6	7
				P		

Then the condition **G __ __ P** forces G into space 2:

1	2	3	4	5	6	7
	G			P		

The condition **LO** must be placed in positions 3 and 4; in spaces 6 and 7 it would violate the condition **L—>news**. This yields

1	2	3	4	5	6	7
	G	L	O	P		

Hence, L must be played third. Note, this question is essentially identical to Question 1.

(E) No. Place the new condition:

1	2	3	4	5	6	7
				P		

Then the condition **G __ __ P** forces G into space 2:

1	2	3	4	5	6	7
	G			P		

The condition **LO** must be placed in positions 3 and 4; in spaces 6 and 7 it would violate the condition

L—>news. This yields

1	2	3	4	5	6	7
	G	L	O	P		

Hence, L must be played third. Note, this question is essentially identical to Question 1.

5.

(A) No. Suppose S is in the first slot and the news is in the last slot:

1	2	3	4	5	6	7
S						news

Next, if G is placed in slot 2, then the condition **G __ __ P** forces P into slot 5:

1	2	3	4	5	6	7
S	G			P		news

The condition **LO** must be placed in slots 3 and 4, which in turn forces H into slot 6:

1	2	3	4	5	6	7
S	G	L	O	P	H	news

This diagram satisfies all the conditions. Hence, a maximum of 5 tapes can separate S from the news.

(B) No. Suppose S is in the first slot and the news is in the last slot:

1	2	3	4	5	6	7
S						news

Next, if G is placed in slot 2, then the condition **G __ __ P** forces P into slot 5:

1	2	3	4	5	6	7
S	G			P		news

The condition **LO** must be placed in slots 3 and 4, which in turn forces H into slot 6:

1	2	3	4	5	6	7
S	G	L	O	P	H	news

This diagram satisfies all the conditions. Hence, a maximum of 5 tapes can separate S from the news.

(C) No. Suppose S is in the first slot and the news is in the last slot:

1	2	3	4	5	6	7
S						news

Next, if G is placed in slot 2, then the condition **G __ __ P** forces P into slot 5:

1	2	3	4	5	6	7
S	G			P		news

The condition **LO** must be placed in slots 3 and 4, which in turn forces H into slot 6:

1	2	3	4	5	6	7
S	G	L	O	P	H	news

This diagram satisfies all the conditions. Hence, a maximum of 5 tapes can separate S from the news.

(D) No. Suppose S is in the first slot and the news is in the last slot:

1	2	3	4	5	6	7
S						news

Next, if G is placed in slot 2, then the condition **G __ __ P** forces P into slot 5:

1	2	3	4	5	6	7
S	G			P		news

The condition **LO** must be placed in slots 3 and 4, which in turn forces H into slot 6:

1	2	3	4	5	6	7
S	G	L	O	P	H	news

This diagram satisfies all the conditions. Hence, a maximum of 5 tapes can separate S from the news.

(E) Yes. Suppose S is in the first slot and the news is in the last slot:

1	2	3	4	5	6	7
S						news

Next, if G is placed in slot 2, then the condition **G __ __ P** forces P into slot 5:

1	2	3	4	5	6	7
S	G			P		news

The condition **LO** must be placed in slots 3 and 4, which in turn forces H into slot 6:

1	2	3	4	5	6	7
S	G	L	O	P	H	news

This diagram satisfies all the conditions. Hence, a maximum of 5 tapes can separate S from the news.

6.

(A) No. The following diagram satisfies all the conditions and has L fourth:

1	2	3	4	5	6	7
H	S	G	L	O	news	P

(B) No. The following diagram satisfies all the conditions and has L fifth:

1	2	3	4	5	6	7
G	H	S	P	L	O	news

(C) Yes. Suppose L is played fifth. Then the condition **LO** forces O to be played sixth, and the condition

L—>news forces the news to be played seventh:

1	2	3	4	5	6	7
				L	O	news

Now, the condition **G __ __ P** can be placed as follows:

1	2	3	4	5	6	7
G			P	L	O	news

This diagram satisfies all the conditions. Hence, L can be played fifth. Furthermore, L cannot be played sixth or seventh because that would violate the conditions **LO** and **L—>news**.

	(D) No. From the two conditions **LO** and **L—>news**, we see that L can be scheduled no later than fifth. (E) No. This violates the condition **LO**.
7.	(A) No. The following valid diagrams have O in different time slots: 1 G, 2 L, 3 O, 4 P, 5 news, 6 H, 7 S 1 G, 2 H, 3 S, 4 P, 5 L, 6 O, 7 news (B) No. The following valid diagrams have O in different time slots: 1 L, 2 O, 3 G, 4 news, 5 H, 6 P, 7 S 1 H, 2 S, 3 G, 4 L, 5 O, 6 P, 7 news (C) No. The following valid diagrams have O in different time slots: 1 L, 2 O, 3 news, 4 G, 5 H, 6 S, 7 P 1 H, 2 L, 3 O, 4 G, 5 news, 6 S, 7 P (D) Yes. If G is fifth, then the condition **G __ __ P** forces P into slot 2: 1 __, 2 P, 3 __, 4 __, 5 G, 6 __, 7 __ The condition **LO** cannot be placed in slots 6 and 7 since that would violate the condition **L—>news**. Hence, **LO** must be placed in slots 3 and 4. Therefore, O can only be played fourth. (E) No. The following valid diagrams have O in different time slots: 1 L, 2 O, 3 P, 4 news, 5 H, 6 G, 7 S 1 H, 2 S, 3 P, 4 L, 5 O, 6 G, 7 news
8.	8. (A) No. The following diagram satisfies all the conditions and does not have Doctor Yasmin lecturing on Monday (L = lecturing, O = operating, T = treating patients, R = conducting research):

WHATSAPP CHANNEL FOR MORE MEDICAL & EDUCATIONAL INFORMATION
https://whatsapp.com/channel/0029VaV72IEC1FuDt56bS53Y
Short link
https://shorturl.at/CYKMc

	M	T	W	F	S
am	O	T	O	O	R
pm	T	L	L	T	T

(B) Yes. Since "On Saturday she neither lectures nor performs operations," she must lecture either Monday and Tuesday or Tuesday and Wednesday

(She lectures in the afternoon on exactly two consecutive calendar days). In either case, this has her lecturing on Tuesday.

Caution: She cannot lecture both Wednesday and Friday because they are not consecutive calendar days.

(C) No. The following diagram satisfies all the conditions and does not have Doctor Yasmin lecturing on Wednesday:

	M	T	W	F	S
am	T	O	O	O	R
pm	L	L	T	T	T

(D) No. The following diagram satisfies all the conditions and does not have Doctor Yasmin lecturing on Friday:

	M	T	W	F	S
am	O	T	O	O	R
pm	T	L	L	T	T

(E) No. This violates the condition "On Saturday she neither lectures nor performs operations."

9. (A) No. "She lectures in the afternoon on exactly two consecutive calendar days" and "She treats patients on exactly one morning and exactly three afternoons." Since her workweek is 5 days long, in the afternoon she can only lecture or treat patients.

(B) No. Suppose she lectures in the morning and treats patients in the afternoon on Wednesday:

	M	T	W	F	S
am			L		
pm			T		

Since "She performs operations on exactly three mornings," and does not operate on Saturdays, the diagram becomes

	M	T	W	F	S
am	O	O	L	O	
pm			T		

However, this violates the condition "If she operates on Monday, she does not operate on Tuesday."

(C) Yes. The following diagram satisfies all the conditions and has Doctor Yasmin

operating Wednesday morning and lecturing Wednesday afternoon:

	M	T	W	F	S
am	O	T	O	O	R
pm	T	L	L	T	T

(D) No. "She lectures in the afternoon on exactly two consecutive calendar days" and "She treats patients on exactly ... three afternoons." Since her workweek is 5 days long, in the afternoon she can only lecture or treat patients.

(E) No. Suppose she treats patients in the morning and in the afternoon on Wednesday:

	M	T	W	F	S
am			T		
pm			T		

Since "She performs operations on exactly three mornings," and does not operate on Saturdays, the diagram becomes

	M	T	W	F	S
am	O	O	T	O	
pm			T		

However, this violates the condition "If she operates on Monday, she does not operate on Tuesday."

10. (A) No. The following diagram satisfies all the conditions and does not have her treating patients in both the morning and the afternoon on any day:

	M	T	W	F	S
am	O	T	O	O	R
pm	T	L	L	T	T

(B) No. The following diagram satisfies all the conditions and does not have her conducting research on the same day she lectures:

	M	T	W	F	S
am	O	T	O	O	R
pm	T	L	L	T	T

(C) No. The following diagram satisfies all the conditions and does not have her conducting research on the same day she treats patients:

	M	T	W	F	S
am	R	O	O	O	T
pm	L	L	T	T	T

(D) No. The following diagram satisfies all the conditions and does not have her

lecturing on the same day she treats patients:

	M	T	W	F	S
am	R	O	O	O	T
pm	L	L	T	T	T

(E) Yes. "On Saturday she neither lectures nor performs operations." Since "She performs operations on exactly three mornings" of the remaining four days and "lectures in the afternoon on exactly two consecutive calendar days," she must both operate and lecture on at least one day.

11. (A) No. This violates the condition "She treats patients on exactly one morning . . ."

(B) No. This violates the condition "She treats patients on exactly one morning . . ."

(C) No. Adding the information to the diagram yields

	M	T	W	F	S
am		O	T		
pm	T		T		T

Clearly, this diagram violates the condition "She lectures in the afternoon on exactly two consecutive calendar days."

(D) No. Adding the information to the diagram yields

	M	T	W	F	S
am		O	T		
pm			T	T	T

Adding the conditions "She performs operations on exactly three mornings" and "On Saturday she [does not] perform operations" yields

	M	T	W	F	S
am	O	O	T	O	
pm			T	T	T

However, this diagram violates the condition, "If she operates on Monday, she does not operate on Tuesday."

(E) Yes. Adding the information to the diagram yields

	M	T	W	F	S
am					T
pm			T	T	T

Adding the condition "She lectures in the afternoon on exactly two consecutive calendar days" yields

	M	T	W	F	S
am					T
pm	L	L	T	T	T

Now, the remaining schedule must be filled in as follows:

	M	T	W	F	S
am	O	R	O	O	T
pm	L	L	T	T	T

This diagram satisfies all the conditions.

12. (A) No. The following diagram satisfies all the conditions and does not have her treating patients on Monday or Tuesday:

	M	T	W	F	S
am	O	R	O	O	T
pm	L	L	T	T	T

(B) No. The following diagram satisfies all the conditions and does not have her treating patients on Monday:

	M	T	W	F	S
am	R	O	O	O	T
pm	L	L	T	T	T

(C) No. The following diagram satisfies all the conditions and does not have her treating patients on Tuesday:

	M	T	W	F	S
am	R	O	O	O	T
pm	L	L	T	T	T

(D) No. The following diagram satisfies all the conditions and does not have her treating patients on Tuesday:

	M	T	W	F	S
am	R	O	O	O	T
pm	L	L	T	T	T

(E) Yes. Since "On Saturday she neither lectures nor performs operations," she must lecture either Monday and Tuesday or Tuesday and Wednesday (She lectures in the afternoon on exactly two consecutive calendar days). She cannot lecture both Wednesday and Friday because they are not consecutive calendar days.

Combining this with the condition "She treats patients on ... exactly three afternoons," yields the two following diagrams:

Diagram I

	M	T	W	F	S
am					
pm	L	L	T	T	T

Diagram II

	M	T	W	F	S
am					
pm	T	L	L	T	T

Thus, in either case, she treats patients on Friday and Saturday.

13.	13. (A) No. This choice has both conservatives and one liberal voting against Datalog. Hence, the hypothesis of Condition 1 is satisfied, and therefore both moderates voted the same way. However, this violates the supplemental condition that "the two moderates did not vote the same way as each other." (B) Yes. This choice has exactly one conservative voting for Datalog. Hence, the other conservative voted against Datalog, which satisfies Condition 4. Again, this choice has exactly one conservative and exactly one liberal voting for Datalog. Hence, the other two liberals voted against Datalog. This gives two people voting for Datalog (one conservative and one liberal) and two people voting against Datalog (two liberals). Hence, Condition 3 is satisfied. Further, Conditions 1 and 2 do not apply. Hence, none of the conditions are violated. **Note,** we did not need the supplementary condition "the two moderates did not vote the same way as each other." This condition was introduced to make some of the other answer-choices incorrect. (C) No. This violates Condition 2. (D) No. Since the moderates split their vote, this violates Condition 1. (E) No. Since the moderates split their vote, this violates Condition 1.
14.	(A) No. If both conservatives voted against Datalog and all three liberals voted for Datalog, then all the conditions are satisfied. (B) No. If both conservatives voted against Datalog and all three liberals voted for Datalog, then all the conditions are satisfied. (C) Yes. Suppose all three liberals voted against Datalog. Then from Condition 2, we know that both conservatives voted for Datalog. However, this violates Condition 4. Hence, at least one liberal voted for Datalog. (D) No. If both conservatives voted against Datalog and all three liberals voted for Datalog, then all the conditions are satisfied. The moderates can cast their votes in any combination. (E) No. If both conservatives voted against Datalog and all three liberals voted for Datalog, then all the conditions are satisfied. The moderates can cast their votes in any combination.
15.	(A) No. In Question 14, we learned that at least one liberal voted for Datalog. So if all three liberals voted the same way, then they must have all voted for Datalog. Now, Condition 2 forces both conservatives to vote against Datalog. This already satisfies all the conditions. Hence, one or both moderates could vote against Datalog. (B) No. In Question 14, we learned that at least one liberal voted for Datalog. So if all three liberals voted the same way, then they must have all voted for Datalog. Now, Condition 2 forces both conservatives to vote against Datalog. This already satisfies all the conditions. Hence, one or both moderates could vote for Datalog.

	(C) No. In Question 14, we learned that at least one liberal voted for Datalog. So if all three liberals voted the same way, then they must have all voted for Datalog. Now, Condition 2 forces both conservatives to vote against Datalog. (D) No. In Question 14, we learned that at least one liberal voted for Datalog. So if all three liberals voted the same way, then they must have all voted for Datalog. Now, Condition 2 forces both conservatives to vote against Datalog. This already satisfies all the conditions. Hence, both moderates could vote for Datalog or both moderates could vote against Datalog. (E) Yes. In Question 14, we learned that at least one liberal voted for Datalog. So if all three liberals voted the same way, then they must have all voted for Datalog.
16.	(A) Yes. From Condition 4, we know that at least one conservative voted against Datalog. Suppose one moderate also voted against Datalog—contradicting choice (A). This forces the three liberals to vote for Datalog. So from Condition 2, we know that both conservatives voted against Datalog. However, this violates our assumption that only one conservative and only one moderate voted for Datalog. (B) No. If exactly two conservatives voted against Datalog and all the other judges voted for Datalog, then all the conditions are satisfied. (C) No. If exactly one liberal and one conservative voted against Datalog and all the other judges— including one conservative—voted for Datalog, then all the conditions are satisfied. (D) No. If exactly two conservatives voted against Datalog and all the other judges voted for Datalog, then all the conditions are satisfied. (E) No. If exactly one liberal and one conservative voted against Datalog and all the other judges voted for Datalog, then all the conditions are satisfied.
17.	(A) No. If both conservatives and both moderates vote against Datalog, then exactly two liberals can vote for Datalog. (B) No. If exactly two liberals and both moderates vote against Datalog, then exactly one conservative and exactly one liberal must vote for Datalog. (C) No. If only the conservatives vote against Datalog, then exactly two moderates and exactly three liberals must vote for Datalog. (D) No. If the only judges to vote against Datalog are one conservative and one liberal, then exactly one conservative, two moderates, and two liberals must vote for Datalog. (E) Yes. Choice (E) has six of the seven judges voting for Datalog. This violates Condition 3, which states "at least two [judges] voted against Datalog."
18.	(A) No. Condition 4 says at least one conservative voted against Datalog, so if both conservatives voted the same way, both conservatives voted against Datalog. (B) Yes. Condition 4 says at least one conservative voted against Datalog, so if both conservatives voted the same way, both conservatives voted against Datalog.

	Additionally, the liberals split their vote, so at least one voted for Datalog and at least one against. Summarizing, the two conservatives and at least one liberal voted against Datalog's petition. Condition 1 then requires that both moderates voted this way. So the moderates cannot vote for Datalog. (C) No. The liberals split their vote, so at least one voted for Datalog and at least one against. (D) No. Condition 4 says at least one conservative voted against Datalog, so if both conservatives voted the same way, both conservatives voted against Datalog. Additionally, the liberals split their vote, so at least one voted for Datalog and at least one against. Summarizing, the two conservatives and at least one liberal voted against Datalog's petition. Now, Condition 1 requires that both moderates voted this way. Thus, at least 5 judges voted against Datalog. Further, since "at least two of the judges voted for Datalog," the two remaining judges—liberals—voted for Datalog. (E) No. Condition 4 says at least one conservative voted against Datalog, so if both conservatives voted the same way, both conservatives voted against Datalog. Additionally, the liberals split their vote, so at least one voted for Datalog and at least one against. **Summarizing,** the two conservatives and at least one liberal voted against Datalog's petition. Now, Condition 1 requires that both moderates voted this way. Thus, at least 5 judges voted against Datalog. Further, since "at least two of the judges voted for Datalog," no more than 5 judges voted against Datalog. In other words, exactly 5 judges voted against Datalog.
19.	**Answer: Option B** The second sentence points out that people should examine what they want from a fitness routine before signing up for a new exercise class. There is no evidence to support choice a. Choice c might sound reasonable due to the fact that the paragraph tells us that yoga has become very popular, but this statement is not supported by the information provided in the paragraph. Choices d and e are also not supported since the paragraph doesn't tell us whether yoga is good for both body and mind or what people think about it.
20.	**Answer: Option D** The last sentence states that new technologies are reported daily, and this implies that new technologies are being constantly developed. There is no support for choice a.With regard to choice b, stone tools were first used two and a half million years ago, but they were not neessarily in use all that time. Choice c is clearly wrong since the paragraph states when stone tools first came into use. Although some may agree that choice e is true, the author of the paragraph does not give support for this opinion.

QUANTITATIVE REASONING

FUNCTIONS

A function is a rule, a "machine" that takes an input and gives an output. When we are told the equation of a function, that equation makes explicit the rule this particular function is following. For example, for the function f(x) = 3x – 5, the rule is: whatever input into x you give —- and that input could be any real number - this function will multiply this input by 3 and then subtract five from the product: that difference is the output. If I put in an input of x = 2, then I get an output of 3(2) – 5 = 1, and the way we compactly write that fact with function notation is: f(2) = 1. In other words, an input of 2 gives an output of 1.

Notice - this is a very subtle issue. The x that appears in the equation of a function is a different sort of variable than the ordinary x of solve-for-x algebra. This x is what one might call a "formula variable", like the a, b, and c in the quadratic formula. In other words, the x of function notation is not an x that is equal to only a single value; rather, it can be set equal to any value, any real number on the number line, when we want to plug that number into the function.

Typical misunderstandings of function notation

When we write f(x), many people new to function notation will misinterpret this as multiplication - as if there's a thing "f" times the variable "x". **That is 100% incorrect**. A function is a process through which the input goes. Cooking is a process through which food goes. A function is a process acting on the number, and the nature of that action is outside the categories of simple arithmetic actions (add, subtract, multiply, divide).

It is not necessary that functions are expressed as f(x). Any notation with defined process can be used as a function. For example; ^K = 3k -2 is a function which expresses that when the symbol ^ is placed before any number, the answer will be made by multiplying the number with 3 and then subtracting 2 from the result.

Example

If ^K = 3K – 3 then find the value of ^7.

Solution

Substituting the 7 at the place of k we get

^7 = 3 × 7 – 3 = 18

Hence; the value of ^7 is 18.

Example

If x ★ y = $2x^2 - 3y$, what is the value of 4 ★ 8?

A. 2
B. 4
C. 8
D. 12
E. 16

Think of doing a function as running a little mathematical machine. This machine takes inputs (numbers or expressions) and makes outputs (more numbers or expressions). There'll be a placeholder or two for inserting some input and a set of instructions for calculating the output. Once you have some input, just stick it in and follow the instructions.

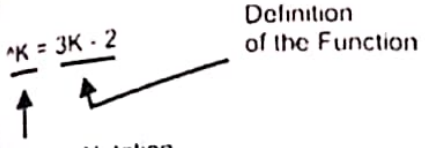
In the example, the ★ tells you it's function time. The variables x and y are the placeholders, and all those familiar operators telling you to square, multiply, and subtract are your instructions. When you get 4 ★ 8, you know to replace x and y with 4 and 8, respectively, and then do the arithmetic.

$x ★ y = 2x^2 - 3y$

$4 ★ 8 = 2(4)^2 - 3(8)$

$= 32 - 24$

$= 8$



So the correct answer is (C).

Functions get harder when the inputs are expressions. Expressions include variables, so you won't be doing just straight arithmetic when you run one through your function. Still, the basic workflow remains the same:

Place inputs ⟹ follow instructions (multiply, divide, etc.) ⟹ savor outputs.

Here's another example problem.

If g ♦ h = 7g −3h, what is the value of a + 5 ♦ a + 3?

A. 4a − 4
B. 4a + 8
C. 4a + 14
D. 4a + 26
E. 4a + 44

The placeholders are **g** and **h.** In the statement **a + 5 ♦ a + 3**, you see that **a + 5** is the input that takes the place of **g**, since both sit to the left of the function symbol. You likewise see that **a + 3** is the input that takes the place of **h**, since both sit to the symbol's right. Put the inputs in **7g − 3h** and knock out the math.

$$g \blacklozenge h = 7g - 3h$$
$$a + 5 \blacklozenge a + 3 = 7(a + 5) - 3(a + 3)$$
$$= 7a + 35 - 3a - 9$$
$$= 4a + 26$$

So the right answer is (D).

Topic Drill

1. If k of any number is obtained by dividing k by 5. Find k of 100.

   A. 5 B. 10
   C. 15 D. 20

2. If $f(x) = (x^3 - 1)$ then f(1) is

   A. 0 B. 1
   C. 2 D. 3

3. If $P = 5p − 5, then find $7.

   A. 10 B. 20
   C. 30 D. 40

4. If K(h) = 3h, then find K(2) × K(3).

   A. 36 B. 42
   C. 18 D. 0

5. Gold of any number is defined as the sum of remainders when the number is divided by 3 and 4. What is the Gold of 24?

   A. 5 B. 4
   C. 3 D. 0

6. Let f and g be the function from the set of integers to itself, defined by f(x) = 2x + 1 and g(x) = 3x + 4. The sum of f and g at x = 0 is

   A. 10 B. 4
   C. 5 D. 20

SOLUTIONS:

Q1.

Answer: D

100 ÷ 5 = 20

Q2.

Answer: A

Replace x with 1. Cube of 1 is 1 so, 1 - 1 = 0

Q3.

Answer: C

5 × 7 − 5 = 30

Q4.

Answer: A

K(2) = 6 and K(3) = 9

Therefore; 6 × 9 = 36

Q5.

Answer: D

When 24 is divided by 3 and 4, the remainder in both cases is zero, therefore; the sum of remainders is zero.

Q6.

Answer: C

Inserting the value of x = 0, f(0) = 1 and g(0) = 4, therefore their sum = 5

PROBABILITY

If an event **E** can happen in **m** ways and fail in **k** ways out of a total of **n** ways, and each of them is equally likely, then the probability of the happening of **E** is.

$$P(E) = \frac{m}{m+k} = \frac{m}{n} \quad \text{where } n = m + k$$

In other words, if a random, experiment is conducted **n** times and **m** of them are favorable to event **E**, then $P(E) = \frac{m}{n}$

$$\text{Probability of an Event} = \frac{\textit{Number of favorable outcome}}{\textit{Total number of Possible outcome}}$$

Example

Find the probability of getting a head in a throw of a coin.

Solution

When a coin is tossed we either get head or tail upwards. So, total number of cases = 2 = n,
number of favorable cases to get H = 1 = m
P (H) = No. of favorable cases/ Total no. of outcomes = (m/n)
=1/2

Example

An unbiased die is rolled. Find the probability of a) Getting a multiple of 3 b) getting a prime number.

Solution

When a die is rolled we can get any one of the numbers from 1 to 6.
Total number of cases = n = 6

a) Let event A= getting a multiple of 3
Then A = {3.6}.
Therefore m = 2
P (A) = m/n = 2/6 = 1/3

b) Let event B = getting a prime number
Then B = {2, 3, 5}.
so, m = 3
P (A) = m/n = 3/6 = ½

Example

A bag contains 6 white beads & 4 red beads. A bead is drawn at random. What is the probability that the bead drawn is white?

Solution

Total no. of beads in the bag = 6 + 4 = 10. So n = 10
Any one of the 6 white beads can be selected, m = 6
Therefore, P (getting white bead) = m/n = 6/10 = 3/5

Topic Drill

1. Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 5?

   A. $\frac{1}{2}$ B. $\frac{2}{5}$

   C. $\frac{8}{15}$ D. $\frac{9}{20}$

2. A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?

   A. $\frac{10}{21}$ B. $\frac{11}{21}$

   C. $\frac{2}{7}$ D. $\frac{5}{7}$

3. In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up

randomly. What is the probability that it is neither red nor green?

A. $\frac{1}{3}$ B. $\frac{3}{4}$

C. $\frac{7}{19}$ D. $\frac{8}{21}$

4. What is the probability of getting a sum 9 from two throws of a dice?

A. $\frac{1}{6}$ B. $\frac{1}{8}$

C. $\frac{1}{9}$ D. $\frac{1}{12}$

5. Three unbiased coins are tossed. What is the probability of getting at most two heads?

A. $\frac{3}{4}$ B. $\frac{1}{4}$

C. $\frac{3}{8}$ D. $\frac{7}{8}$

6. Two dice are thrown simultaneously. What is the probability of getting two numbers whose product is even?

A. $\frac{1}{2}$ B. $\frac{3}{4}$

C. $\frac{3}{8}$ D. $\frac{5}{16}$

7. In a class, there are 15 boys and 10 girls. Three students are selected at random. The probability that 1 girl and 2 boys are selected, is:

A. $\frac{21}{46}$ B. $\frac{25}{117}$

C. $\frac{1}{50}$ D. $\frac{3}{25}$

8. In a lottery, there are 10 prizes and 25 blanks. A lottery is drawn at random. What is the probability of getting a prize?

A. $\frac{1}{10}$ B. $\frac{2}{5}$

C. $\frac{2}{7}$ D. $\frac{5}{7}$

9. Two dice are tossed. The probability that the total score is a prime number is:

A. $\frac{1}{6}$ B. $\frac{5}{12}$

C. $\frac{1}{2}$ D. $\frac{7}{9}$

10. A card is drawn from a pack of 52 cards. The probability of getting a queen of club or a king of heart is:

A. $\frac{1}{13}$ B. $\frac{2}{13}$

C. $\frac{1}{26}$ D. $\frac{1}{52}$

SOLUTIONS

Q1.

Answer: Option D

Here, S = {1, 2, 3, 4, ..., 19, 20}.

Let E = event of getting a multiple of 3 or 5 = {3, 6 , 9, 12, 15, 18, 5, 10, 20}.

$P(E) = \frac{n(E)}{n(S)} = \frac{9}{20}$

Q2.

Answer: Option A

Total number of balls = (2 + 3 + 2) = 7.

Let S be the sample space.

Then, n(S) = Number of ways of drawing 2 balls out of 7

$= {}^{7}C_{2}$

$= \frac{(7\times6)}{(2\times1)}$

= 21.

Let E = Event of drawing 2 balls, none of which is blue.

n(E) = Number of ways of drawing 2 balls out of (2 + 3) balls.

$= {}^{5}C_{2}$

$= \frac{(5\times4)}{(2\times1)}$

= 10.

$P(E) = \frac{n(E)}{n(S)} = \frac{10}{21}$

Q3.

Answer: Option A

Total number of balls = (8 + 7 + 6) = 21.

Let E = event that the ball drawn is neither red nor green

= event that the ball drawn is blue.

n(E) = 7.

$P(E) = \frac{n(E)}{n(S)} = \frac{7}{21} = \frac{1}{3}$

Q4.

Answer: Option C

In two throws of a dice, n(S) = (6 x 6) = 36.

Let E = event of getting a sum ={(3, 6), (4, 5), (5, 4), (6, 3)}.

$P(E) = \frac{n(E)}{n(S)} = \frac{4}{36} = \frac{1}{9}$

Q5.

Answer: Option D

Here S = {TTT, TTH, THT, HTT, THH, HTH, HHT, HHH}

Let E = event of getting at most two heads.

Then E = {TTT, TTH, THT, HTT, THH, HTH, HHT}.

$P(E) = \frac{n(E)}{n(S)} = \frac{7}{8}$

Q6.

Answer: Option B

In a simultaneous throw of two dice, we have n(S) = (6 x 6) = 36.

Then, E = {(1, 2), (1, 4), (1, 6), (2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6), (3, 2), (3, 4),

(3, 6), (4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6), (5, 2), (5, 4), (5, 6), (6, 1),

(6, 2), (6, 3), (6, 4), (6, 5), (6, 6)}

n(E) = 27.

$P(E) = \frac{n(E)}{n(S)} = \frac{27}{36} = \frac{3}{4}$

Q7.

Answer: Option A

Let S be the sample space and E be the event of selecting 1 girl and 2 boys.

Then, n(S) = Number ways of selecting 3 students out of 25

$= 25_{C_3}$

$= \frac{(25 \times 24 \times 23)}{(3 \times 2 \times 1)}$

= 2300.

$n(E) = (10_{C_1} \times 15_{C_2})$

$= 10 \times \frac{(15 \times 14)}{(2 \times 1)}$

= 1050.

$P(E) = \frac{n(E)}{n(S)} = \frac{1050}{2300} = \frac{21}{46}$

Q8.

Answer: Option C

$P(\text{getting a prize}) = \frac{n(E)}{n(S)} = \frac{10}{(10+25)} = \frac{10}{35} = \frac{2}{7}$

Q9.

Answer: Option B

Clearly, n(S) = (6 x 6) = 36.

Let E = Event that the sum is a prime number.

Then E = { (1, 1), (1, 2), (1, 4), (1, 6), (2, 1), (2, 3), (2, 5), (3, 2), (3, 4), (4, 1), (4, 3),

(5, 2), (5, 6), (6, 1), (6, 5) }

n(E) = 15.

$P(E) = \frac{n(E)}{n(S)} = \frac{15}{36} = \frac{5}{12}$

Q10.

Answer: Option C

Here, n(S) = 52.

Let E = event of getting a queen of club or a king of heart.

Then, n(E) = 2.

$P(E) = \frac{n(E)}{n(S)} = \frac{2}{52} = \frac{1}{26}$

VERBAL REASONING

SENTENCE CORRECTION

The following rules should be kept in mind while attempting these questions:

Parts of Speech

Notice that the different parts like adjective, adverb, nouns, pronouns, conjunctions, interjections, verbs are correctly used.

Example

He plays real good. (Incorrect)

He plays really well. (Correct)

Subject Verb Agreement

The subject should agree with the verb. For a singular subject we will use a singular verb and for a plural subject we will use a plural verb.

Example

A number of colorful glass vases was displayed in the store window. (Incorrect)

A number of colorful glass vases were displayed in the store window. (Correct)

Parallelism

The different words in the sentence, performing the same function should be in the same format.

Example

All business students should learn word processing, accounting, and how to program computers. (Incorrect)

All business students should learn word processing, accounting, and computer programming. (Correct)

Modifiers

A modifier is any word or phrase which modifies the subject. The modifier has to be placed next to the subject it modifies.

Example

Covered in mud, Mark helped the puppy. (Incorrect)

Covered in mud, the puppy was helped by Mark. (Correct)

Diction

Use of the correct words in the correct place.

Example

See you latter. (Incorrect)

See you later. (Correct)

Redundancy

Avoid needless repetition of the same idea.

Example

We will return back on Monday. (Incorrect)

We will return on Monday. (Correct)

Example

The President of Costa Rica, along with two vice-presidents, are elected for a four-year term by the people.

A. are elected for a four-year term by the people.
B. are elected, by the people, for a four-year term.
C. is elected for a four-year term by the people.
D. are elected for four-year terms by the people.
E. is elected for four-year terms by the people.

Here, the answer will be option C as it uses the correct the subject verb agreement rule that

with "The President" the singular verb "is" will be used.

Example

Previously thought to have been extinct, a team of biologists rediscovered the New Caledonia crested gecko in 1994.

A. a team of biologists rediscovered the New Caledonia crested gecko in 1994.
B. a team of biologists, in 1994, rediscovered the New Caledonia crested gecko.
C. in 1994 the New Caledonia crested gecko was rediscovered by a team of biologists.
D. and discovered by a team of biologists in 1994 was the New Caledonia crested gecko.
E. the New Caledonia crested gecko was rediscovered by a team of biologists in 1994.

The correct answer is option **E** as the modifier extinct is used for the New Caledonia crested gecko and not the team of biologists.

Some Important Correct Usage

Please note: The **first** sentence is incorrect and the **second** is correct.

1. She prides on her beauty.
   She **prides herself** on her beauty.
2. Students should avail of good opportunity.
   Students should **avail themselves** of good.
3. We enjoyed at the party.
   We **enjoyed ourselves** at the party.
4. There is nothing such as luck.
   There is **no such thing** as luck.
5. Tell me how are you.
   Tell me **how you are**.
6. He jumped a ten feet wide ditch.
   He jumped **a ditch ten feet wide**.
7. What for has he come?
   What has **he come for**?
8. This will not only interest children, but also good men.
   This will interest not only children but also good men.
9. I neither know the name of the author, nor the bookseller.
   I know the name of **neither the author nor the bookseller**.
10. He was either educated at Bombay or at Madras.
    He was educated either **in Bombay or in Madras**.
11. Walking is good both for health and recreation.
    Walking is good for **both health and recreation**.
12. The milk of a cow is too nutritious.
    The milk of a cow is **very nutritious**.
13. Mohan lived in a boarding.
    Mohan lived in a **boarding house**.
14. He has taken admission in a law college.
    He **has been admitted** to a law college.
15. He feels very weak to walk.
    He feels **too weak to walk**.
16. The tide was so strong that the rope was torn.
    The tide was so strong that the **rope broke**.
17. The boat was drowned.
    The boat **sank**.
18. Do it or you will be beaten.
    Do it or you **shall be beaten**.
19. If they make noise, they will be fined.
    If they make **a noise** they shall be fined.
20. He is suffering from a strong cold.
    He is suffering from a **bad cold**.

21. Cattle is grazing in the field.
Cattle are grazing in the field.

22. The gentry of this town does not like it.
The **gentry** of this town **do not like it.**

23. The police has arrested him.
The **police have** arrested him.

24. I shall go to my quarter.
I shall go to my **quarters.**

25. I have four son-in-laws.
I have four **sons-in-law.**

26. My house is built of bricks.
My house is **built of brick.**

27. He is true to his words.
He is true to **his word.**

28. I have three pairs of shoes.
I have three pairs of **shoe.**

29. He did three-fourth of the work.
He did **three-fourths** of the work.

30. He had to do several works.
He had to do **several pieces of work.**

31. Let he and I do it together.
Let **him** and **me** do it together.

32. They are all there but I.
They are all there but **me.**

33. Who do you take me for?
Whom do you take me for?

34. I would not do that if I were him.
I would not do that if **I were he.**

35. He answered more questions than me.
He answered more questions than **I.**

36. They are wiser than us.
They are wiser than **we.**

37. We are poorer than them.
We are poorer than **they.**

38. One should respect his teacher.
One should respect **one's** teacher.

39. One does not like to have his work doubted.
One does not like to have **one's** word doubted.

40. One must not boast of his own success.
One must not boast of **one's own success.**

41. Everyone should respect one's teacher.
Everyone should respect **his** teacher.

42. Anyone can do this if one tries.
Anyone can do this **if he** tries.

43. Everybody wants to have their full pay.
Everybody wants to have **his** full pay.

44. Whom do you think he is?
Who do you think he is?

45. Who did you see?
Whom did you see?

46. He was the man whom I thought was very poor.
He was the **man who** I thought was very poor.

47. This is one of the interesting stories that has been told by Tolstoy.
This is one of the interesting **stories that have been** told by Tolstoy.

48. This is one of the best buildings that has come into my view.
This is one of the best buildings **that have come** into my view.

49. It is I who is to blame.
It is I **who am** to blame.

50. This is the man who was there and no one saw.
This is the man **who was there** and **whom no one saw.**

51. This is the book which was there and none knew.
This is the book **which was there** and **which none knew.**

52. I want your reply.
I want a **reply from you.**

53. I availed of the opportunity.
I **availed myself** of the opportunity.

54. The absented for that day.
They **absented themselves** for that day.

55. Any of the two men can do it.
Either of the two men can do it.

56. None of the two boys were present.
Neither of the two boys was present.

57. This is the best which we can do.
This is the **best that we can do.**

58. I, he and you will play.
You, he and I will play.

59. Indore of today is the most populous town of M.P.
The Indore of today is the most populous town of M.P.

60. Ganga is our sacred river.
The Ganga is our sacred river.

61. He begins work at daybreak and leaves off at the sunset.
He begins work at daybreak and leaves off **at sunset**.

62. Rose is a red flower.
The rose is a red flower.

63. Sun rises by 6 a.m. these days.
The Sun rises by 6 a.m. these days.

64. Do not pull the cat by its tail.
Do not pull the cat **by the tail.**

65. He is the principal of this college.
He is Principal of this college.

66. Principal of this college is coming.
The Principal of this college is coming.

67. This is no time to sing.
This is **not the time** to sing.

68. No boy in the class is so good as Raman.
No other boy in the class is as good as Raman.

69. He is older than anybody in the village.
He is **older than anybody else** in the village.

70. He is elder than his sister.
He is **older** than his sister.

71. There were no less than a hundred men.
There **were not fewer** than a hundred men.

72. He dare me to fight with him.
He **dares me to fight** with him.

73. He dare leave the room.
He **dares to** leave the room.

74. He dare say so.
He **dares to** say so.

75. Forgave him for his fault.
I forgave him his fault.

76. We envy him for his good luck.
We **envy him his** good luck.

77. He left for them all his wealth.
He **left them** all his wealth.

78. This man bears me with a grudge.
This man **bears me a** grudge.

79. I advice you to wait.
I advise you to wait.

80. This book proved to be of no use.
This **book proved of no use**.

81. He said me good morning.
He **bade me good** morning.

82. You have rather played than worked.
You **had rather play** than work.

83. The ship drowned in the sea.
The **ship was sunk** in the sea.

84. The boy sank in the river.
The **boy drowned** in the river.

85. I am here since 1981.
I have been here since 1981.

86. I shall reach there by this time tomorrow.

I **shall have reached** there by this time tomorrow.

87. Do you remember to see me?
Do you remember **to have** seen me?

88. I will be reading for two years more.
I will **have been reading** for two years more.

89. It's high time (that) you go home.
It's high time (that) **you went home.**

90. We rejoiced at him being promoted.
We rejoiced **at his being promoted.**

91. I have no faith in him keeping his promise.
I have no faith in **his keeping** his promise.

92. I was very surprised at hearing this news.
I **was much surprised** at hearing this news.

93. The air is very hotter today than yesterday.
The air is **much hotter today than it was yesterday.**

94. This news is much surprising.
This news is **very surprising.**

95. He is comparatively better today.
He is **comparatively well** today.

96. This house is comparatively cheaper.
This house is **comparatively cheap.**

97. He goes to the cinema off and on.
He goes to the cinema **now and then.**

98. I shall, of course, come here tomorrow.
I shall certainly come here tomorrow.

99. Is the whole always greater than the part? Certainly, it is.
Is the whole – part? **Of course,** it is.

100. He lost his son and certainly he felt much grieved.
He lost his son **and, of course,** he felt much grieved.

101. He sought for his missing friend far and away.
He sought for his missing friend **far and wide.**

102. Men under 25 year of age will be selected.
Men below 25 years of age will be selected.

103. No one under an officer's rank need apply.
No one below an officer's rank need apply.

104. My income is under Rs. 50000/- per month.
My income **is below Rs. 50000/- per month.**

105. Upon enquiry I found him guilty.
On enquiry I found him guilty.

106. I did not expect such treatment from your hand.
I did not expect such a **treatment at your hands.**

107. I am independent from my parents.
I am **independent of my parents.**

108. I beg pardon from you.
I beg pardon of you.

109. Poverty comes from idleness.
Poverty comes of idleness.

110. He is quick in understanding.
He is **quick of** understanding.

111. He is dull in hearing.
He is **dull of** hearing.

112. He is a man possessed with great wealth.
He is a man **possessed of** great wealth.

113. Be not a slave of smoking.
Be not a **slave to** smoking.

114. One angle is supplement of another.
One angle is **supplement to** another.

115. Never take up bad means to earn money.
Never **take to bad means** to earn money.

116. Health is essential for happiness.
Health is **essential** to happiness.

117. It is ten in my watch.
It is **ten by my watch**.

118. Your fault does not admit any excuse.
Your fault does not **admit of** any excuse.

119. You cannot conceive a better way than this.
You cannot **conceive of a better way** than this.

120. He is lame by the left leg.
He is lame **in the left leg**.

121. You are disqualified to manage your estate.
You are **disqualified from** managing your estate.

122. He persisted to say this.
He **persisted in** saying this.

123. He is charged of murder.
He is **charged with** murder.

124. I will communicate to him on this subject.
I will **communicate with him on** this subject.

125. I have no control on him.
I have **no control over** him.

126. He glanced at a letter.
He glanced **over a letter**.

127. I felt much grief at him.
I felt much **grief for him**.

128. There is no guarantee of his honesty.
There is no **guarantee for** his honesty.

129. He is the heir to his uncle.
He is **the heir of his uncle**.

130. He is the heir of a large estate.
He is the **heir to a large estate**.

131. I am much concerned with your welfare.
I am much **concerned for your welfare**.

132. He is slow in accounts.
He is **slow at** accounts.

133. He is slow in hearing.
He is **slow of** hearing.

134. He couldn't cope up with his work.
He couldn't **cope with** his work.

135. He is not so tall as his brother.
He is **not as tall as his brother**

136. He is so clever as his brother.
He is **as clever as his brother**.

137. Copy it word by word.
Copy it **word for word**.

138. Your excuse holds no water.
Your excuse does **not hold water**.

139. He left the town with bag and baggage.
He left the **town bag and baggage**.

140. He did not leave any stone upturned.
He left **no stone upturned**.

141. I am confident to win.
I am confident of winning.

142. I can talk English well.
I can **speak English** well.

143. The officer say my certificates.
The officer looked **into my certificates**.

144. Inform this accident to the police.
Inform the police of this accident.

145. Take care of her until she is with you.
Take care of her **as long as** she is with you.

146. One must learn to distinguish good from bad.
One must learn to distinguish **the good from the bad**.

147. I went there with a view to buy a book.
I went there with a view **to buying a book**.

148. I did nothing but cried.
I did nothing **but cry**.

149. Please write your name with ink.
Please write your **name in ink**.

150. To laugh or weep is entirely our own choice.
To laugh or to weep is entirely our own choice.

Topic Drill

1. After he graduated from college, his parents gave him a new car, ten thousand dollars, and sent him on a trip around the world.

   A. After he graduated from college, his parents gave him a new car, ten thousand dollars, and sent him on a
   B. After he graduated from college, his parents gave him a new car, ten thousand dollars, and a
   C. After graduating from college, his parents gave him a new car, ten thousand dollars, and a
   D. After he had graduated from college, his parents gave him a new car, ten thousand dollars, and sent him on a
   E. After graduating from college, his parents gave him a new car, ten thousand dollars, and sent him on a

2. When one reaches the first plateau, it does not guarantee that you will complete the climb to the summit.

   A. When one reaches the first plateau, it
   B. Because one reaches the first plateau, it
   C. One's reaching the first plateau
   D. That you have reached the first plateau
   E. Reaching the first plateau

3. Four financial analysts prepare a summary of stock market activity each week, and it is broadcast by them on public radio.

   A. each week, and it is broadcast by them
   B. each week, and then it is broadcast
   C. each week and it is broadcast by them
   D. each week, and they broadcast it
   E. broadcasting each week

4. According to the critics, the PTV awards ceremony was tasteless, according to the audience, it was better than ever.

   A. was tasteless, according to
   B. was tasteless according to
   C. was tasteless, and according to
   D. was tasteless, but according to
   E. was tasteless but to

5. Each year, about fifty thousand books are published in Great Britain, that is as many as in the four-times-larger United States.

   A. published in Great Britain, that is as many as in
   B. published in Great Britain; that is as many as in
   C. published in Great Britain; as many as in
   D. published in Great Britain; which is as many as in
   E. published in Great Britain as many as in

6. Exercising without proper warm-ups can be as harmful to the body as if you didn't exercise at all.

   A. as if you didn't exercise at all.
   B. as no exercise at all.
   C. than not exercising at all.
   D. than no exercise.

E. as your not getting any exercise at all.

7. The Punjab museum in Lahore has the largest collection of great Mughal paintings in the whole world.

A. The Punjab museum in Lahore has the largest collection of great Mughal paintings in the whole world.

B. The Punjab museum in Lahore has the world's largest collection of great Mughal paintings.

C. It is the Punjab museum in Lahore that has the largest collection of the world's great Mughal paintings.

D. The greatest collection of Mughal paintings in the world is held by the Punjab museum in Lahore.

E. In Lahore, it is the Punjab museum that holds the world's largest collection of great Mughal paintings.

8. The strike cannot be settled until the growers agree to improve health-care benefits and improving the workers' housing.

A. and improving the workers' housing.

B. and improving worker housing as well.

C. and to improve the workers' housing.

D. and the workers' housing.

E. and also to the improvement of the housing of the workers.

9. When swimming for KPK, Gul Khan set records that lasted for ten years.

A. Gul Khan set records that lasted for ten years.

B. the records Gul Khan set lasted ten years.

C. ten-year records were set by Gul Khan.

D. the records of Gul Khan lasted ten years.

E. Gul Khan's records lasted ten years.

10. With just a few quick slashes of the sword, her opponents were defeated by the fencer, capitalizing on their slowness.

A. her opponents were defeated by the fencer, capitalizing on their slowness

B. the fencer defeated her opponents, capitalizing on their slowness

C. the fencer capitalized on the slowness of her opponents, defeating them

D. the fencer defeated her opponents and also capitalized on their slowness

E. her opponents and their slowness were defeated by the fencer

SOLUTION:

Q 1.

Correct answer is B. The problem in the original sentence is parallelism. The verb "gave" begins a series with nouns as objects ("car," "dollars"), but the third part of the series ("and sent him on") interrupts the series. Choices B and C correct this error by making "trip" a third object of "gave." Choice C cannot be right because it begins with a dangling participle; it appears that the parents are graduating from college.

Q 2.

Correct answer is E. There is an inconsistency in the pronouns in this sentence. The part that cannot be changed uses "you," but the underlined section uses "one." A right answer will either use "you" or get rid of the pronoun altogether. Choices A, B, and C cannot be right, but D and E are both grammatically correct. In this case, E is preferable because it is more direct.

Q 3.

Correct answer is D. The first clause of the sentence uses a verb in the active voice ("prepare"), but the second clause uses a passive ("is broadcast"). Choice D uses active verbs in both parts of the sentence, while A, B, and C keep the passive. C is also a run-on sentence. E is briefer but it loses some of the meaning of the sentence.

Q 4.

Correct answer is D. There are two independent clauses here. They can be two separate sentences, or one sentence with either a semicolon or a conjunction and a comma. A and B leave the conjunction out, and E leaves out the comma. The punctuation is correct in C and D, but D is a better choice, since the two halves of the sentence contrast, and "but" denotes a contrary idea to follow.

Q 5.

Correct answer is B. The error in the original sentence is the comma splice — joining the two independent clauses (or complete sentences) with just a comma. Correct the error by using a period, a comma with a conjunction, or, as here, a semicolon. Though C and D use semicolons, they no longer have independent second clauses, while E, which has made the second clause dependent, omits the comma.

Q 6.

Correct answer is B. The idiom to use with the construction "as-adjective-... " is "as-adjective-as." B is better than A because it is shorter and does not change from a third person to a second person subject ("exercising" to "you").

Q 7.

Correct answer is B.

Although the original version is not ungrammatical, B is less wordy, replacing "in the whole world" with the more economical "the world's." C and E add the unnecessary "it is," while D uses the passive voice, always more wordy than the active.

Q 8.

Correct answer is D. The phrases "to improve health-care benefits" and "improving the workers' housing" are repetitive and not parallel. Choice B is wordy and not parallel. Choice C corrects the parallelism error, but not the repetition. Choice E is wordy. Choice D is brief and grammatical.

Q 9.

Correct answer is A.

The phrase that begins this sentence has an understood but unwritten subject — the person who was swimming at KPK. The phrase will dangle unless this subject follows the comma. Only A puts the understood subject immediately after this phrase. Choices B, C, D, and E all make it look as if the "records" were the swimmers.

Q 10.

Correct answer is B. A and E are passive. This question also has to do with order of relevance. What is the most important thing the fencer did? She defeated her opponents. That should be mentioned before the fact that she capitalized on their slowness. Eliminate C. B may not appear to be parallel but it is more efficient than D. It describes how she defeated her opponents. This is the intention of the sentence rather than listing a series of activities the fencer did. A list would require parallel structure.

VOCABULARY

Following is a list of English words with meaning. You are advised to memorize all these words. All these words will be used in the Verbal section in the next module.

Abhorrent	Inspiring disgust and loathing; repugnant.
Acrimonious	(typically of speech or discussion) angry and bitter.
Adequately	To a satisfactory or acceptable extent.
Consecutively	One after another without interruption.
Contiguous	Sharing a common border; touching.
Countertop	worktop
Desperately	In a way that shows despair.
Diminishing	Make or become less
Impeach	Call into question the integrity or validity of (a practice).
Loathsome	Causing hatred or disgust; repulsive.
Nostalgic	Feeling, evoking, or characterized by nostalgia.
Presumably	Used to convey that what is asserted is very likely though not known for certain.
Quarrelsome	Given to or characterized by quarrelling.
Revolutionize	Change (something) radically or fundamentally.
Rodents	A gnawing mammal of an order that includes rats, mice, squirrels, hamsters, porcupines, and their relatives, distinguished by strong constantly growing incisors and no canine teeth. They constitute the largest order of mammals.
Subsume	Include or absorb (something) in something else.

HAT GRAND TEST

ANALYTICAL REASONING

Directions for Analytical Reasoning Questions: The questions in these sections are divided into groups.

Each group is based on a set of conditions. For each question, choose the answer that is most accurate and complete. For some questions, you may wish to draw a rough diagram to help you select your response.

Mark the corresponding space on your Answer Sheet.

Question 1 to 6 are based on following statement

Six dogs A, B, C, D, E, and F will visit three vets in this next week. Each dog will visit only one vet and each vet will see at least one dog. The vets' names are Trump, Bush, and Jimi.

Who the dogs see is determined by the following:

The vet that sees A will only see one dog.

F sees the same vet as C.

If a vet sees B, then that vet does not see E.

1. If Jimi sees A and Trump sees F, then which of the following must be false?
   A. Trump sees E and D.
   B. Jimi sees only one dog.
   C. Bush sees D and C.
   D. Bush sees two dogs.
   E. Trump sees four dogs.

2. Which of the following could NOT be a complete list of the dogs that Trump sees?
   A. F, C, B, D.
   B. E, D
   C. C.
   D. E, F, C
   E. F, C

3. If A is seen by Jimi and B is seen by Bush, then which of the following dogs does Trump have to see?
   A. A.
   B. C
   C. D.
   D. E
   E. F

4. If Bush sees only two dogs, then which dog does he have to see?
   A. B.
   B. C
   C. D.
   D. E
   E. F

5. If Trump sees four dogs, then which dog must he NOT see?
   A. A.
   B. C
   C. D.
   D. E
   E. F

6. What is the total number of different dogs any of whom Trump could potentially see?
   A. one
   B. two
   C. four
   D. five
   E. six

Questions 7–13

At a party, there are a number of people in line for the slip and slide. Certain people like to talk to each other in line and so order themselves accordingly. There are a total of seven people waiting in line: A, B, C, D, E, F, and G.

Their order is governed by the following constraints:

A goes immediately before B.
D goes immediately after C.

E goes immediately before F.
G goes before D.
E goes after G.

7. Which of the following is a possible order of the line from first to last?
   A. A, B, C, D, G, E, F.
   B. C, D, G, A, B, E, F.
   C. E, F, C, D, G, A, B.
   D. A, B, G, E, C, D, F.
   E. G, A, B, E, F, C, D.

8. If C goes in slot 4, which slot could the most people potentially go in?
   A. 1 B. 2
   C. 5 D. 6
   E. 7

9. If D goes in slot 5, then which of the following must be false?
   A. G goes in slot 1.
   B. G goes before F
   C. G goes in slot 2.
   D. G goes in a slot numbered lower than 3
   E. G goes in a lower-numbered slot than C.

10. If D goes in slot 5, then which of the following must be false?
   A. F goes in the last slot.
   B. C goes in slot 4
   C. D goes in slot 6.
   D. F goes in slot 3.
   E. G goes in slot 1

11. Which is a complete list of the slots where C can NOT go?
   A. 2, 3, 5. B. 1, 4, 5, 6, 7.
   C. 1, 3, 5, 7. D. 1, 2, 4, 5.
   E. 1, 3, 5

12. If D goes last, then we know the exact position of how many variables in all, including D?
   A. one B. two
   C. three D. four
   E. five

13. If C goes second and E goes before A, then which of the following could not be true?
   A. G goes first B. D goes third
   C. A goes after F D. E goes fifth.
   E. A and B go consecutively

Questions 14–19

At a motorcycle conference, riders are paired with specific bikes in order to show them off to the crowd.

Four riders A, B, C, and D are paired with four bikes R, S, T, and U. Bikes are placed in rooms numbered from 1 to 4; each room has one rider and one bike only.

The pairs are governed by the following rules:

Rider A is paired with bike T.

Rider D is not paired with bike S.

Rider C is not paired with bike U.

Rider A is in room 2.

If rider D is in room 1, then rider C is in room 4.

If bike U is in room 3, then rider D is in room 1.

14. If rider C is in room 1, then which of the following must be true?
   A. Rider C is paired with bike R.
   B. Rider D is paired with bike U.
   C. Bike U is in room 4.
   D. Bike T is in a higher-numbered room than bike S.
   E. Rider B is in room 3.

15. If bike U is not in room 3, then which of the following must NOT be true?
   A. Rider D is with bike U
   B. Bike T is in room 2.
   C. Rider D is in room 1.
   D. Bike U is in room 4.
   E. Rider A is in room 3.

16. If rider C is in room 4 and bike R is in room 1, then which of the following must be true?

A. Rider B is paired with bike U.
B. Rider D is in a room after rider A.
C. Bike S is not paired with rider C or B.
D. Bike T is in a consecutive room with rider C.
E. Bike T is in a room that is consecutive with only one other bike.

17. If Bike U is paired with rider D, then which of the following must be false?
A. Rider B is in room 4.
B. Bike R is room 3.
C. Bike U is in room 1
D. Rider C is in room 3.
E. Bike S is in room 1

18. If bike T is not in a consecutive room with rider C or bike S, then which of the following must be true?
A. Bike R is in room 1
B. Bike S is in room 4.
C. Bike U is in room 3.
D. Rider D is in room 1.
E. Rider B is in room 3.

19. If rider D is not paired with bike U, then each of the following could be false EXCEPT:
A. Rider A is with bike U.
B. Rider B is with bike U.
C. Rider C is with bike U.
D. Bike U is in a room consecutive with bike T.
E. Bike U is in a room consecutive with bike S.

Questions 20–26

A piece of cheese is sitting on the countertop in a house. The mice realize that the only way that they can get around the cat to get the cheese is by forming teams. Team Distract will have only three rodents. Team Sprint will have only three rodents. Team Capture will have exactly two rodents. The mice are named A, B, C, D, E, F, G, and H.

The following rules govern the overall makeup of the teams:

Rodent E is not on a team with rodent D.

Rodent B is on a team with rodent F.

If rodent F is on team Distract, then rodents D and C will be on team Sprint.

If rodent F is on team Sprint, then rodents E and G will also be on team Sprint.

If rodent F is on team Capture, then rodents A and D will be on team Sprint.

20. Which of the following pairs of rodents could NOT be part of team Sprint?
A. E and A.
B. C and D
C. G and C.
D. H and E
E. A and C.

21. Which of the following is a possible makeup of team Capture?
A. G, H
B. H, D.
C. E, B.
D. F, H.
E. D, C

22. Which rodent could be assigned to only one team?
A. A.
B. B
C. C.
D. D
E E

23. Which of the following pairs of rodents always share a team?
A. A, D.
B. C, G.
C. E, A.
D. H, G.
E. F, B.

24. Which rodents could never share a team?
A. C, E
B. F, D
C. E, B.
D. G, H.
E. A, D.

25. Which of the following is a complete list of the rodents that could be on team Sprint?

A. A, C, D, G, H
B. B, C, D, G, H
C. A, C, D, E, G, H.
D. A, D, G, H
E. C, D, G, H.

26. If H and A are on team Capture, then which of the following must NOT be true?

A. F and B are on team Distract.
B. F and G are on different teams
C. C and E share a team.
D. D and C are on team Sprint
E A and H do not share a team with another rodent

Directions

The questions in this section are based on the reasoning contained in brief statements or passages. For some questions, more than one of the choices could conceivably answer the question. However, you are to choose the best answer; that is, the response that most accurately and completely answers the question.

Passage

Electricity would revolutionize agriculture according to a prediction of the not-so-distant future published in 1940. Electrodes would be inserted into the soil, and the current between them would kill bugs and weeds and make crop plants stronger.

27. Which of the following, if true, most strongly indicates that the logic of the prediction above is flawed?

A. In order for farmers to avoid electric shock while working in the fields, the current could be turned off at such times without diminishing the intended effects
B. If the proposed plan for using electricity were put into practice, farmers would save on chemicals now being added to the soil
C. It cannot be taken for granted that the use of electricity is always beneficial.
D. Since weeds are plants, electricity would affect weeds in the same way as it would affect crop plants.
E. Because a planting machine would need to avoid coming into contact with the electrodes, new parts for planting machines would need to be designed.

Passage

The Suzuki car company's design for its new luxury model, the Max 100, included a special design for the tires. That was intended to complement the model's image. The winning bid for supplying these tires was submitted by Rehan. Analysts concluded that the bid would only just cover Rehan's costs on the tires, but Rehan executives claim that winning the bid will actually make a profit for the company.

28. Which of the following, if true, most strongly justifies the claim made by Rehan's executives?

A. In any Suzuki model, the spare tire is exactly the same make and model as the tires that are mounted on the wheels
B. Rehan holds exclusive contracts to supply Suzuki with the tires for a number of other models made by Suzuki.
C. The production facilities for the Max 100and those for the tires to be supplied by Rehan are located very near each other.
D. When people who have purchased a carefully designed luxury automobile need to replace a worn part of it, they almost invariably replace it with a part of exactly the same make and type.

E. When Suzuki awarded the tire contract to Rehan, the only criterion on which Rehan's bidwas clearly ahead of its competitors' bids was price.

Passage

The high school math department needs to appoint a new chairperson, which will be based on seniority. Ms. Waseema has less seniority than Mr. Talat, but more than Ms. Babara. Mr. Rehan has more seniority than Ms. Waseema, but less than Mr. Talat. Mr. Talat doesn't want the job.

29. Who will be the new math department chairperson?

A. Mr. Rehan B. Mr. Talat
C. Ms. Waseema D. Ms. Babara

Passage

All the trees in the park are flowering trees. Some of the trees in the park are dogwoods. All dogwoods in the park are flowering trees.

30. If the first two statements are true, the third statement is

A. True B. False
C. Uncertain D. Irrelevant

QUANTITATIVE REASONING

Directions

Solve each of the problems with four/five answer choices and indicate the best of the answer choices.

31. How many prime numbers are less than 50?

A. 16 B. 15
C. 14 D. 18

32. A factory buys 7 machines. 2 Machine A, 2 Machine B and rest Machine C. Prices of the machines are Rs 95000, Rs 75000 and Rs 43000 respectively. Calculate the average cost of these machines?

A. 71000 B. 67000
C. 75000 D. 65500

33. The value of x for which the expressions 7x + 13 and 13x - 7 become equal is _____?

A. -10/3 B. 3/10
C. -3/10 D. 10/3

34. A can do a work in 15 days and B in 9 days. If they work on it together for 5 days, then what fraction of work is left?

A. 1/6 B. 3/7
C. 1/3 D. 1/9

35. On dividing $256a^2b^2c^2$ by $64a^2$, we get?

A. $2c^2$ B. $2b^2$
C. 4 D. $4b^2c^2$

36. Rehman walks at 8 km/hr and Roma cycles at 13 km/hr towards each other. What was the distance between them when they started if they meet after 36 minutes?

A. 12.6 kms B. 18.9 kms
C. 15.8 kms D. 9.5 kms

37. On a Principal of Rs. 48000 if the Simple interest for two years is Rs 4800. What is the rate of Interest?

A. 5 percent B. 10 percent
C. 20 percent D. 25 percent

38. Two students appeared for an examination. One of them secured 24 marks more than the other and his marks were 65% of the sum of their marks. The marks obtained by them are _____?

A. 78 and 54 B. 85 and 61
C. 67 and 43 D. 52 and 28

39. If 3x - 4 > 2 - x/3 and 3x + 5 > 4x - 5; then find the value of x?

A. 7 B. 10
C. -11 D. 1

40. When a discount of 25% is given on a wedding gown, the profit is 32%. If the discount is 17%, then the profit is _____?

A. 46.08 percent B. 49 percent
C. 51.92 percent D. 43.16 percent

41. If 3x + 2y = 7 and 4x - y = 24, then x - y = _____?

A. 9 B. 1
C. -9 D. -1

42. Find the area of a triangle whose base is of 8 cm and height is 6cm.

A. 12 B. 24
C. 48 D. 60

43. If 60% of $\frac{3}{5}$ of a number is 36, then the number is:

A. 50 B. 100
C. 150 D. 200

44. At 24% discount the selling price of a washing machine is Rs 38000, what is the selling price if the discount is 40%?

A. Rs 18000 B. Rs 30000
C. Rs 22320 D. Rs 31920

45. What is the average of first hundred positive integers?

A. 49.5 B. 50.5
C. 51.5 D. 50.0

46. One number is double of the other and their sum is 15. What is the smaller number?
A. 5 B. 10
C. 15 D. 20

47. $112 \times 54^4 = ?$
A. 67000 B. 70000
C. 76000 D. 77200

48. $(800 \div 64) \times (1296 \div 36) = ?$
A. 450 B. 400
C. 500 D. 540

49. The smallest prime number is
A. 1 B. 2
C. 3 D. 0

50. The unit digit in the product (784 x 618 x 917 x 463) is
A. 2 B. 3
C. 4 D. 5

51. $\frac{(963+476)^2+(963-476)^2}{(963\times963+476\times476)} = ?$
A. 8 B. 4
C. 2 D. 1

52. The greatest number of four digits which is divisible by 15, 25, 40 and 75 is
A. 9000 B. 9400
C. 9600 D. 9800

53 The ratio of two numbers is 3 : 4 and their H.C.F. is 4. Their L.C.M. is:
A. 12 B. 16
C. 24 D. 48

54. 252 can be expressed as a product of primes as
A. 2 x 2 x 3 x 3 x 7 B. 2 x 2 x 2 x 3 x 7
C. 3 x 3 x 3 x 3 x 7 D. 2 x 3 x 3 x 3 x 7

55. if $x + \frac{1}{x} = 4$, find $x^4 + \frac{1}{x^4} = ?$
A. 194 B. 196
C. 198 D. 100

56. if $x + \frac{1}{x} = 2$, then the value of $(x^2 + \frac{1}{x^2})(x^3 + \frac{1}{x^3})$ is
A. 20 B. 4
C. 8 D. 16

57. A sum of money is to be distributed among A, B, C, D in the proportion of 5 : 2 : 4 : 3. If C gets Rs. 1000 more than D, what is B's share?
A. Rs. 500 B. Rs. 1500
C. Rs. 2000 D. Rs. 5000

58. A can do a job in 20 days, B in 30 days and C in 60 days. If A is helped by B and C every 3rd day. How long will it take for them to complete the job?
A. 12 days B. 4 days
C. 15 days D. 18 days

59. Two filling pipes can fill a tank in 15 hours and 12 hours respectively while a third pipe C can empty it in 20 hours when filled. If the tank is empty and all the three pipes are opened, in how much time will the tank be full?
A. 14 hours B. 10 hours
C. 6 hours D. 8 hours

60. In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green?
A. 1/3 B. ¾
C. 7/19 D. 5/11

VERBAL REASONING

Directions

Each question consist of two words which have a certain relationship to each other followed by four pairs of related words, Select the pair which has the same relationship.

61. BEVERAGE : COCKTAIL ::
A. donkey : mule
B. Air : fresh
C. water : canteen
D. metal : alloy

62. AMBLE : DASH
A. trot : gallop
B. race : competition
C. stroll : crawl
D. hunger : food

63. COGNIZANT : OBLIVIOUS
A. cryptic : covert
B. obeisant : disrespectful
C. overt : obvious
D. cogent : convincing
E. incongruous : concrete

64. CONTIGUOUS : NEIGHBORING
A. bungalow : cottage
B. disassociated : related
C. abrupt : friendly
D. attached : duplex
E. ambiguous : appalling

65. SCALES : FISH ::
A. gills : lungs
B. tail : claws
C. hare : fur
D. treble : bass
E. feathers : bird

Directions

In the following questions choose the word which has the exact OPPOSITE meaning of the given words.

66. GARNISH
A. Involute
B. Florid
C. Hone
D. Divest
E. Paint

67. STYGIAN:
A. Cheerful
B. Turpitude
C. Prudish
D. Nonplused
E. Ineffable

68. IMPUGN:
A. Renovate
B. Trite C. Streak
D. Uphold

69. RESCIND
A. Subsume
B. Validate
C. Pertain
D. Obtain
E. Inveigh

70. IMPERATIVE:
A. Nonobligatory
B. Compulsory
C. Evasive
D. Dubious
E. Frugal

Directions

In the following the questions choose the word which has similar meaning or best expresses the meaning of the given word.

71. Abrogate
A. Usurp
B. Treasure
C. Retain
D. Abolish

72. Abjure
A. Assert
B. Retain
C. Renounce
D. Defend

73. Abhorrent
A. Loathsome B. Quarrelsome
C. Candid D. Appealing

74. Vindicate
A. Precipice B. Defend
C. Impeach D. Impute

75. Frivolous
A. Possessive B. Strict
C. Serious D. Silly

Directions

Each sentence has one or two blanks. Choose the answer choice that contains the word or words that best complete the sentence.

76. .Moona is _____ writing stories because she was well honed by her job as a reporter in a leading newspaper.
A. proficient in B. incapable of
C. incompetent at D. slovenly in

77. My father did not approve of some of my friends and he said that I was _____ in choosing them.
A. choosy B. selective
C. particular D. indiscriminate

78. The manager would _____ her subordinates into a discussion by asking a few searching questions.
A. hounD. B. subdue
C. prejudice D. provoke

79. With his ____ eyesight, Raju spotted the military jet streaking in the sky.
A. inferior B. poor
C. keen D. myopic

80. Seeing the pictures of our old home made me feel _____ and nostalgic
A. fastidious B. indignant
C. wistful D. conciliatory

Directions

This question presents a sentence, all or part of which is underlined. Beneath the sentence you will find four/five ways of phrasing the underlined part. Choose the one that corrects the sentence grammatically and expresses the original idea of the sentence.

81. <u>If the gardener would sow the seeds in the greenhouse rather than the garden,</u> he might get a better display of flowers
A. If the gardener would sow the seeds in the greenhouse rather than the garden
B. If the gardener sowed the seeds in the greenhouse rather than the garden
C. If the gardener would sow the seeds in the greenhouse rather than in the garden
D. If the gardener were to sow the seeds in the greenhouse rather than in the garden
E. If the gardener would sow the seeds in the greenhouse instead of the garden

82. The population of tigers in the National Park is increasing <u>steadily, and this</u> is a source of encouragement to those who have worked so hard to fund the conservation effort.
A. steadily, and this
B. steadily: which
C. steadily; this trend
D. steadily, this increase
E. steady, and this

83. During the early days of hockey, before the development of the modern hockey, almost the only long passes attempted were those that are desperately thrown as time expired.
A. During B. almost
C. those D. are

Tense of verb; "were desperately" is correct.

84. Healthy climate of Kaghan will restore not only his health but his good nature as well.
A. Healthy B. will
C. health D. but
A person is healthy, climate is healthful.

85. Dentists have clearly shown the relation between Vitamin C intake plus freedom from scurvy.
A. have B. clearly
C. plus D. from
Diction; "and" is the correct conjunction; "plus" is too casual.

86. The best manufactured dresses, although not as prestigious as designer clothing, is almost its equal in elegance and flair.
A. although B. not as
C. is D. almost
Subject-verb agreement. The subject is "dresses"; "dresses are," not "dresses is."

87. Millions of Pakistanis were introduced to classical music by Ustad Ghulam Ali, who begun to broadcast his young people's concerts over Pakistan radio.
A. of B. begun to
C. broadcast D. over
Tense of verbs. "Begun" is the past participle and needs a helper like "was" or "had" to be a verb. "Began," a verb in the past tense, is correct.

88. If they had stayed at room more often, the situation would be far different than it is today.
A. had
B. stayed at
C. more often
D. far different than

89. His difficult to assert himself made Mansoor a lifelong junior manager in his company.
A. difficult B. to assert
C. lifelong D. in his
Idiomatic use of prepositions; "difficulty in asserting" is correct.

90. This is my final idea that solution to the problem lays right before our eyes.
A. is B. to
C. lays D. before
Lies means rests and lays means puts.

Reading comprehension

Directions (91-95): You have a brief passage with questions. Read the passage carefully and choose the best answer to each question out of the four alternatives.

Passage

Although speech is the most advanced form of communication, there are many ways of communicating without using speech. Signals, signs, symbols and gestures may be found in every known culture. The basic function of a signal is to impinge upon the environment in such a way that it attracts attention, as, for example, the dots and dashes of a telegraph circuit. Coded to refer to speech, the potential for communication is very great. Less adaptable to the codification of words, signs also contain meaning in and of themselves. A stop sign, for example, conveys meaning quickly and conveniently. Symbols are more difficult to describe than either signals or signs because of their intricate relationship with the receiver's cultural perceptions. In some cultures, applauding in a theatre provides performers with an auditory symbol of approval. Gestures such as waving and handshaking also communicate certain cultural messages.

Although signals, signs, symbols and gestures are very useful, they do have a major

disadvantage. They usually do not allow ideas to be shared without the sender being directly adjacent to the receiver. As a result, means of communication intended to be used for long distances and extended periods are based upon speech. Radio, television and the telephone are only a few of such means.

91. According to the passage, what is signal?
   A. A form of communication used across long distances
   B. The cultural perception of communication
   C. A type of communication that interrupts the environment
   D. A complicated form of communication to describe

92. Choose the correct statement
   A. Speech is the most advanced form of communication
   B. Speech is the only form of communication
   C. Speech is the basis for communication to occur.
   D. Speech is dependent upon the advances made by inventors

93. Choose the most appropriate title for the passage
   A. Signs and signals
   B. Gestural communication
   C. Speech variations
   D. Means of communication

94. Why were the telephone, radio and TV invented?
   A. To provide new forms of entertainment
   B. It was believed that signs, signals and symbols were obsolete.
   C. It was difficult to understand symbols.
   D. People wanted to communicate across long distances

95. This passage explains that.....
   A. Symbols are the easiest to interpret
   B. Signals, signs, symbols and gestures are forms of communication
   C. Significance of waving and handshaking is different in different cultures
   D. Different cultures have different signs and symbols

Passage

Akbar had quarreled with Birbal over something important and had asked him not to come to the palace again. Akbar started missing Birbal and wanted him back, but could not find out where he was. Akbar hit upon a plan. He sent a message to all the villages that wells had been selected to wed the royal well and so they had to bring the bride to the capital immediately.

The headmen of the various villages were alarmed at the impossible task and came rushing to the capital to apologies for their inability to move their wells. One man, Khaji, however, came to discuss the details of the wedding. Khaji wanted to know whether the marriage ceremony would be conducted in the traditional manner. Akbar assured him that all the formalities would be observed. Khaji was happy and assured Akbar that he would bring the bride to the gates of the city. Khaji added that according to the tradition, the bridegroom was to meet the bride at the village gates and take her into the city. He also asked Akbar when was the commitment date from the bridegroom so that they could set out with the bridal party.

Akbar was happy to hear all this. He realized that such an intelligent idea could be though out only by the fertile brain of Birbal and told Khaji that he did not want the well but the man who gave him the idea.

96. Why did Akbar decide to perform the marriage?
   A. He wanted to know how marriages are performed
   B. He wanted to increase the water in his well
   C. He wanted to test the intelligence of the village Headmen
   D. He wanted to find out the whereabouts of Birbal

97. Which of the following is not true in the context of the passage?
   A. According to Akbar, Birbal was the most intelligent man in his kingdom
   B. Khaji thought of the idea that the marriage of wells should be conducted in a traditional manner
   C. Akbar enjoyed Birbal's company
   D. The King's well was to be the bridegroom

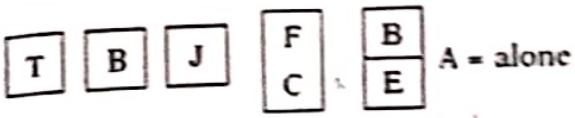
98. Which of the following is true in the context of the passage?
   A. Akbar never quarreled with others on small matters
   B. Akbar ordered all the village headmen to find out about Birbal
   C. Every village headman did not reach to Akbar's marriage in the same way
   D. Khaji was to bring to bridegroom to the village gates

99. Why did Akbar say that he did not want the well which Khaji was offering?
   A. Akbar did not like the demands which Khaji was making
   B. Akbar's intention behind his plan to perform the marriage was fulfilled
   C. There was not much water in the well
   D. None of these

100. Why did Khaji come to meet Akbar?
   A. He wanted to know whether the marriage would be performed in a traditional manner
   B. He wanted to know whether the bridegroom could come to his village gate to receive the bride
   C. He wanted to know why Akbar had thought of the marriage between wells
   D. He wanted to know when the marriage ceremony was to be he

ANSWERS AND EXPLANATION

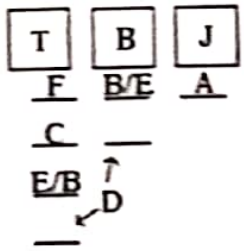
Analytical Reasoning



D?

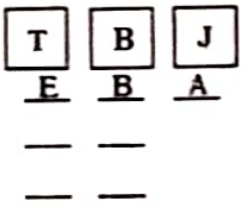
Hint for Question 1-6

1. Correct Answer: **C.** Thus Bush cannot see D and C because Trump must see C.

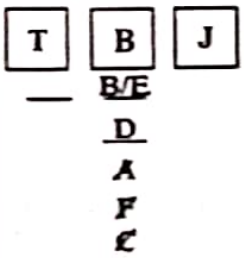


2. Correct Answer: **E.** He could not only see F and C, because A would have to be seen alone and this would cause the third vet to have to see B and E together, which is impossible.

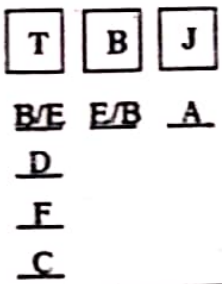
3. Correct Answer: **D.** Trump would have to see E.



4. Correct Answer: **C.** If any vet sees only two dogs, then that vet is required to see D.



5. Correct Answer: **A.** He cannot see A. He has the option of not seeing either E or B, but not both.



6.	Correct Answer: E. Any vet can see all of the dogs.

Hint for Question 7 to 13

AB CD EF

EF

G

CD

After reviewing this setup, it appears that there are eight configurations for the variables according to the following diagrams.

1. a. A B G E F C D
   b. C D E F

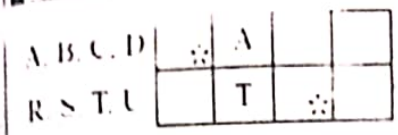
2. a. G A B C D E F
   b. E F C D

3. a. G C D A B E F
   b. E F A B

4. a. G E F A B C D
   b. C D A B

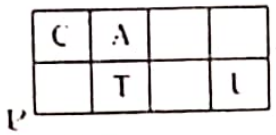
7.	Correct Answer: E. This is a possible setup. See scenario 2b.
8.	Correct Answer: B. If C goes in slot 4, then D always goes in slot 5. Slots 6 and 7 could have E, A or F, B respectively. So that is two people each. Slot 1 can have only A or G. Slot 3 is not mentioned, so slot 2 is the answer since it can have B, A, and E.
9.	Correct Answer: C. D goes in slot 5 in scenarios 1.b., 2.a., and 4.b. This does not matter though, because it is clear from the constraints that G must always go in slot 1 or slot 3.
10.	Correct Answer: E. This is only possible in scenario 4 and in this scenario G must go in slot 1.
11.	Correct Answer: C. C can go in slots 2, 4, and 6 so C cannot go in slots 1, 3, 5, and 7.
12.	Correct Answer: B. D can go last in three scenarios so we only know the position of C.
13.	Correct Answer: D. This occurs in scenario 3.b. We can see that E must go fourth, not fifth.

Hint for Question 14 to 19

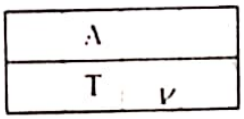


Notice that U3 → D1 → C4.

14. Correct Answer: **C.** This would cause bike U to go in room 4, because it cannot go with rider C and if it goes in room 3, then rider D would have to go in room 1 which is impossible.



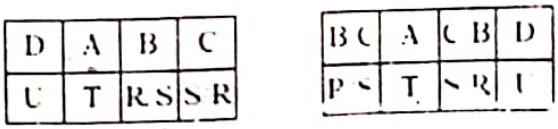
15. Correct Answer: **E.** All of these answer choices are possible.



16. Correct Answer: **A.** Rider B has to be paired with bike U in room 3.

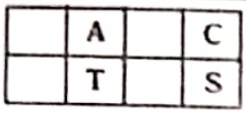
D	A	B	C
R	T	U	S

17. Correct Answer: **A.** If bike U is with rider D, then U cannot go in room 3; putting it there would force D into room 1, which would separate it from U. Thus there are two possible ways to place D and U together:

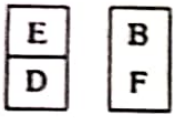


In both of these cases, choice (A) is false.

18. Correct Answer: **B.** This would mean that rider C and bike S have to be together in room 4.

	
19.	Correct Answer: B. If rider D is not paired with bike U, then it must be paired with bike R; A is already paired with T, and D cannot be paired with S. Since rider C cannot be paired with bike U, rider B—the only **remaining unpaired rider—must be.** **Thus, choice (B) could never be false.**

Hint for Question 20 to 26

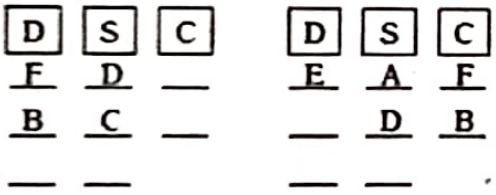


$F_D \rightarrow D_S,\ C_S$

$F_S \rightarrow E_S,\ G_S$

$F_C \rightarrow A_S,\ D_S$

Based on this information, we should see how F influences the game based on where he goes. Notice that F can't be on team Sprint, because then there would not be enough room for B to go with him.



20.	Correct Answer: A. E could never be on team Sprint with A.
21.	Correct Answer: A. G and H could be on the team together when F is on team Distract.
22.	Correct Answer: D. D must always be assigned to team Sprint.
23.	Correct Answer: E. F and B must share a team in both scenarios.
24.	Correct Answer: B. F and D can never be on the same team since F is never on team Sprint and D is always on team Sprint.
25.	Correct Answer: A. The rodents that could be on team Sprint are A, C, D, G, and H. E cannot go there because E cannot be on the same team as D.
26.	Correct Answer: C. G must be on team Sprint with D and C because E cannot share a team with D.
27.	The correct answer is D.

	Option A : The logic of the prediction has nothing to do with whether the current can be turned on and off; rather, it is concerned with the current itself and its effects. Option B : Rather than suggesting that the logic of the prediction is flawed, this serves to support the prediction: Farmers saving on chemicals would be part of the predicted agricultural revolution. Option C : The argument does not take for granted that the use of electricity is always beneficial; it merely suggests that it would be of great benefit to agriculture. Option D : Correct. This statement properly identifies a problem with the prediction: It provides no reason to believe that the electricity would affect crop plants and weeds differently. Option E : Rather than suggesting that the logic of the prediction is flawed, this serves to support the prediction: Changes in planting machines would be part of the predicted agricultural revolution.
28.	The correct answer is D. Option A : We have already been told that the bid is expected to barely cover the costs of supplying the tires on the new cars, so the analysts mentioned in the passage have presumably already taken into account that there is a spare tire supplied for the Max 100. Option B : If winning the bid led Rehan to win more exclusive contracts with the Suzuki, that might help support the executives' claim. But this statement indicates only that Rehan already has several exclusive contracts to supply Suzuki with tires, not that winning the bid has led to, or will lead to, more such contracts, which is what would be needed. Option C : As in answer choice (A), this is relevant to the costs of supplying the tires for the Max 100, but presumably this was taken into account by the analysts when they concluded that the bid would barely cover Rehan's costs on the tires. Option D : Correct. This indicates that by winning the bid Rehan has create the way to profit from the contract with Suzuki, specifically, by creating a market for replacement tires. Option E : This is likely one of the reasons that Rehan's bidonly just covers the Rehan's costs on the tires; it does nothing to justify the executives' claims that the bid will lead to a profit for Rehan.
29.	The correct answer is A. Mr. Talat has the most seniority, but he does not want the job. Next in line is Mr. Rehan, who has more seniority than Ms. Waseema or Ms. Babara.
30.	The correct answer is A. All of the trees in the park are flowering trees, So all dogwoods in the park are flowering trees.

Quantitative Reasoning

31.	**Ans.(B)** Prime numbers less than 50 are. 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47
32.	**Ans.(b)** Total Cost of Machine A = 95000×2 Total Cost of Machine B = 75000×2 Total Cost of Machine C = 43000×3 Average Cost= [1000(95×2+75×2+43×3)]/7 = [1000(190 + 150 + 129)]/7 =67000
33.	**Ans.(d)** 7x + 13 = 13x - 7 => 13x - 7x = 13+7 => 6x = 20 X = 20/6 = 10/3
34.	**Ans.(d)** A→ 15 days 3 45 B→ 9 days .5 (A + B)'s 1 day work = 3 + 5 = 8 (A + B)'s 5 day work = 8 × 5 = 40 Remaining work = 45 – 40 = 5 Fraction of Remaining work = 5/45=1/9
35.	**Ans.(D)** $\frac{256\,a^2b^2c^2}{64a^2}$ $= 4b^2c^2$
36.	**Ans.(a)** Time at which they meet = (Distance between then)/(Relative speed) 36 minutes= D/(8+13) 36/60=D/21 D = (36/60) × 21 = 12.6 km
37.	**Ans.(A)** Simple interest for one year = 4800/2 = 2400 Now P = 48000 I = 2400 T = 1 R = ? I = Prt 2400 = 48000 × r × 1 Therefore; r = (2400/48000) × 100 = 100 / 20 = 5%
38.	**Ans.(D)** Let marks scored by one candidate = x Marks scored by other candidate = x + 24 x + 24 = (65/100) (x + x + 24) 20x + 24 × 13 = 26x + 24 × 13

	$x = 28$ Marks scored by other candidate = 28 + 24 = 52
39.	**Ans.(a)** $3x - 2 > 2 - x/3$ $3x + x/3 > 4$ $10x/3 > 4$ $x > 6/5$ ...(i) $3x + 5 > 4x - 5$ $10 > x$ $x < 10$ ...(ii) $1.2 < x < 10$ x can only be 7
40.	**Ans.(a)** Discount = 25% Profit = 32% $P = M - D - (MD/100)$ $32 = M - 25 - (25M/100)$ $57 = 3M/4$ $M = 76\%$ $P = M - D - (MD/100)$ $= 76 - 17 - (76 \times 17)/100$ $= 76 - 17 - 12.92$ $= 46.08$
41.	**Ans. (A)** $3x + 2y = 7$ ----------I $4x - y = 24$ ----------II Multiply equation II by 2 and then add both equations. $3x + 2y = 7$ $\underline{8x - 2y = 48}$ $11x = 55$ $X = 55/11$ $X = 5$ Put the value of x in equation I $3 \times 5 + 2y = 7$ $2y = 7 - 15$ $Y = -4$ Therefore; $x - y = 5 - (-4) = 5 + 4 = 9$
42.	**Ans.(B)** Area of Triangle = bh/2 $= 8 \times 6 / 2 = 24$
43.	**Ans.(B)** Let the number be x Then 60% of $\frac{3}{5}$ of $x = 36$ $\Rightarrow \frac{60}{100} \times \frac{3}{5} \times x = 36$ $\Rightarrow x = \left(36 \times \frac{25}{9}\right) = 100$

44.	**Ans. (B)** Let the original cost = x = 76% g x = 38,000 = x = 50,000 = price after 40% discount 50,000 – 40% (50,000) = 30,000
45.	**Ans.(B)** Average of equally spaced values = (first number + last number) /2 (1 + 100)/2 = 50.5
46.	**Ans.(A)** If the sum of the numbers is 15, then the only pair of numbers in the ratio of 1:2 is 5 and 10. Therefore; 5 is the required number.
47.	**Ans. (B)** $(112 \times 5^4) = 112 \times \left(\frac{10}{2}\right)^4 = \frac{112 \times 10^4}{2^4} = \frac{1120000}{16} = 70000$
48.	**Ans (A)** $= \frac{800}{64} \times \frac{1296}{36} = 450$
49.	**Ans. (B)** The smallest prime number is 2
50.	**Ans. (A)** Unit digit in the given product = Unit digit in (4 x 8 x 7 x 3) = (672) = 2
51.	**Ans. (C)** $\frac{(a+b)^2 + (a-b)^2}{(a^2+b^2)} = \frac{2(a^2+b^2)}{(a^2+b^2)} = 2$
52.	**Ans. (C)** Greatest number of 4-digits is 9999. L.C.M. of 15, 25, 40 and 75 is 600. On dividing 9999 by 600, the remainder is 399. Required number (9999 - 399) = 9600.
53.	**Ans.(D)** Let the numbers be 3x and 4x. Then, their H.C.F. = x. So, x = 4. So, the numbers 12 and 16. L.C.M. of 12 and 16 = 48.
54.	**Ans.(A)** 252 = 2 x 2 x 3 x 3 x 7
55.	**Ans. (a)** $= x + \frac{1}{x} = 4$ $= x^4 \frac{x}{x^4} = 14$ $= x^4 \frac{1}{x^4} = 196-2$ = 194
56.	**Ans.(b)**

$x + \frac{1}{x} = 2 \rightarrow x^3 + \frac{1}{x^3}$ = (Value)^3 - 3(value)

$= 8 - 3 \times 2$

$= 2$

-2

$x^2 + \frac{1}{x^2} = 4 - 2$

$= 2$

Now,

$$\left(x^2 + \frac{1}{x^2}\right)\left(x^3 + \frac{1}{x^3}\right) = 2 \times 2$$

$= 4$

57. **Ans. (c)**

Let the shares of A, B, C and D be Rs. 5x, Rs. 2x, Rs. 4x and Rs. 3x respectively.
Then, 4x - 3x = 1000
$\Rightarrow$ x = 1000.
B's share = Rs. 2x = Rs. (2 x 1000) = Rs. 2000.

58. **Ans. (c)**

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https://whatsapp.com/channel/0029VaV72IEC1FuDt56bS53Y
Short link
https://shorturl.at/CYKMc

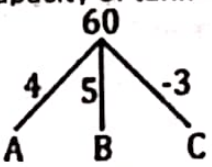
A→20
B → 30
C → 60
Pattern is A, A (A + B + C)

S.No.	Days	Work
1.	3	(3 + 3 + 6) = 12
5.	5 ×3	12 × 5

So, Days = 15

59. **Ans. (b)**

A→15
B → 12
C→20
Capacity of tank = L.C.M (15, 12, 20) = 60



time = $\frac{60}{6}$ = 10 hours

60. **Ans. (A)**

Total number of balls = (8 + 7 + 6) = 21.
Let E = event that the ball drawn is neither red nor green
= event that the ball drawn is blue
$n(E) = 7$.

$$P(E) = \frac{n(E)}{n(S)} = \frac{7}{21} = \frac{1}{3}.$$

Verbal Reasoning

61. The correct answer choice is D. A beverage mixed with another beverage is called a cocktail. A metal mixed with another metal is called an alloy.

62. The correct answer choice is A. An amble is a slow walk. A dash is a quick run. A trot is a slow walk on horseback. A gallop is a quick run on horseback.

63. The correct answer choice is B. Cognizant is the opposite of oblivious. Obeisant is the opposite of disrespectful.

64. The correct answer choice is D. Two things that are beside each other are contiguous. Two houses beside each other are neighboring. Houses that are attached are call duplexes.

65. The correct answer choice is E. A fish is covered in scales. A bird is covered in feathers.

66. The best answer is D.
To Garnish is to decorate. To Divest is to strip, make bare and is the antonym.
Involute means complex.
Florid means reddish.
A Hone is a stone used for sharpening tools.
Verve means spirit, vigor.

67. The best answer is A.
Stygian means dark, gloomy. Cheerful is the antonym.
Turpitude means wickedness.
Prudish means easily shocked.
Nonplused means greatly surprised.
Ineffable is too great to be described in words.

68. The best answer is D.
To Impugn means to assail to attack. To Uphold means to defend and is the antonym.
To Renovate means to restore something to better condition.
To Vitiate is to weaken the strength.
Trite is not new.
To Streak means to move very fast.

69. The best answer is B.
To Rescind means to retract, to cancel. To Validate is the antonym.
To Subsume is to include under a rule.
To pertain is to belong as a part.
To Obtain is to get hold of something.
To inveigh means to attack verbally.

70. The best answer is A.
Imperative means essential. The antonym is Nonobligatory.
Compulsory is a synonym.
Frugal is careful, economical.
Evasive means tending to evade.
Dubious means feeling doubt.

71. Correct answer is D.
Meaning: Abrogate is defined as to end something, especially when some formal step is needed to end it.
Example: Our rights cannot be denied or abrogated by the Government.
Synonyms: Annul, Nullify, Undo, Revoke, Quash
Antonyms: Approve, Enact, Pass, Permit

72. Correct answer is C.
Meaning: The meaning of abjure is to take back something, especially when you must take it back formally or by some specific process.
Example: He abjured all his titles after the controversy.
Synonyms: Recant, Forswear, Renege, Renounce, Withdraw

Antonyms: Allow, Emphasize,

73. Correct answer is A.
Meaning: Abhorrent is something offensive to the mind, causing disgust, hatred etc.
Example: They consider it abhorrent how she keeps her dog chained all the time.
Synonyms: Disgusting, Loathsome, Repulsive, Despicable
Antonyms: Innocuous, Inoffensive, Acceptable

74. Correct answer is B.
Meaning: To vindicate is defined as to clear someone of criticism or blame.
Example: He acted in the courts to vindicate his rights.
Synonyms: Absolve, Defend, Disprove, Justify
Antonyms: Blame, Charge, Condemn, Convict, Deny

75. Correct answer is D.
Meaning: The meaning of frivolous is something that has little value or importance or is silly or trivial.
Frivolous things are silly or unnecessary.
Example: Your frivolous lawsuit has no value in this court.
Synonyms: Foolish, Idiotic, Pointless, Petty, Trivial
Antonyms: Intelligent, Sensible, Wise, Grave, Serious

76. Correct answer is (A). 'Proficient' means to be adept or well versed in any branch of learning. The words in the other options do not support the fact that the reporter honed her skills at the newspaper she was working with.

77. Correct answer is (D). 'Indiscriminate' means choosing randomly in a haphazard fashion. The words in the other options are contrary to what the father expects

78. Correct answer is (D). 'To provoke' is to call forth a feeling or action. The other options can be eliminated because they are not appropriate to the context of the sentence

79. Correct answer is **C**
'Keen' means being extremely sensitive, responsive or finely sharpened. In the other options the attributes refer to poor eyesight and would not contribute to spotting the jet!

80. Correct answer is **(C)**
Wistful means sad about something past.
(fastidious = choosy and difficult to please.
Indignant = Angry, Conciliatory = making compromise or befriending.)

81. Option(D) is correct
The conditional clause (the "if" clause) does not require would. Also we should write "inthe garden" to be parallel to "in the greenhouse".

82. Correct answer is **C**
Both ***which*** and ***this*** should refer to a specific noun. Since the first part of the sentence does not provide a suitable noun, we must introduce a word such as ***increase*** or ***trend***. D is incorrect as it uses a comma to link two sentences.

83. D
84. A
85. C
86. C
87. B
88. C
89. A
90. C

91. Ans.(c)
A type of communication that interrupts the environment.

92. Ans.(a)
Speech is the most advanced form of communication.

93. Ans.(d)
Means of communication

94. Ans.(d)
People wanted to communicate across long distances.

95. Ans.(d)
Different cultures have different signs and symbols.

96. Ans.(d)
He wanted to find out the whereabouts of Birbal. Akabar tricked people to find Birbal.

97. Ans.(b)
According to the passage, not khaji but Birbal was behind the idea.

98. Ans.(c)
Every village headman did not reach to Akbar's marriage in the same way

99. Ans.(b)
Akbar's intention behind his plan to perform the marriage was fulfilled

100. Ans.(a)
He wanted to know whether the marriage would be performed in a traditional manner

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